The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXV, No. 3 CHICAGO February 11, 1922

EDITORIAL DEPARTMENT—

Nathan C. Rockwood, Editor
Chas. A. Breskin,
H. E. Hopkins,
Associate Editors

ADVERTISING STAFF—

Charles H. Fuller, Eastern Manager,
101 West 41st Street, New York City

A. S. Barnett,
Western Representative

SUBSCRIPTION—Two dollars a year to U. S. and Possessions. Three dollars a year to Canada and foreign countries. Twenty-five cents for single copies.

TO SUBSCRIBERS—Date on wrappers indicates issue with which your subscription expires. In writing to have address changed, give old as well as new address.

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ROCK PRODUCTS—

Geo. P. Miller, Manager
E. M. Gibson, Assistant Manager

Published every other Saturday by

TRADEPRESS PUBLISHING CORP.,
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
N. C. Rockwood, Vice-President
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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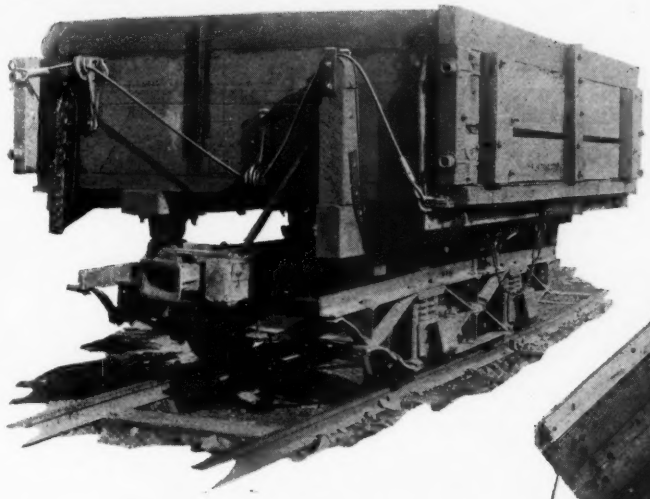
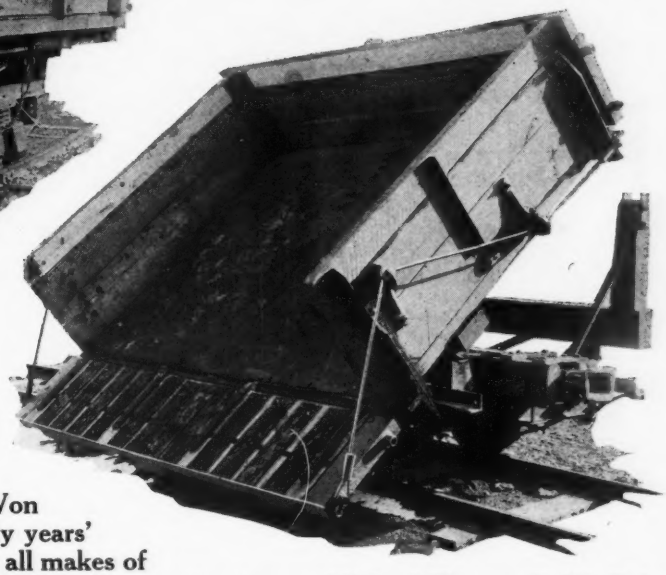
EASTON *WON-WAY* DUMP CAR





Ask Steve Pode!

We did, and this is what he wrote:

"You asked my opinion of the Easton Won Way Car; I will flatly state that with twenty years' experience as steam shovel engineer loading all makes of cars, and ninety per cent in rock with such well known contractors as Michael Elmore, E. W. Foley Corpn., on the Cape Cod Canal, and six years' service in the rock end of the Panama Canal, my opinion is that for a power dumped car the Easton Won Way Car has no equal."

Steve Pode

AND OTHERS SAY:

Your cars ***function perfectly.***

You have ***full control*** of the contacts of the car.

You have ***increased the capacity*** of the cars.

This type of car ***rides the track*** under all conditions.

Danger of ***derailment is eliminated.***

The load ***does not*** have to be evenly distributed nor in balance.

No need to hook to the track to prevent tipping over when dumped.

Door troubles and interference are ***eliminated.***

To men who believe in ***safety first*** this car should be a winner.

No ***loose chains*** to battle with.

After a year's operation we are convinced that your idea is a good one.

The ***most satisfactory*** car I have ever loaded.

The Easton Won Way car is good for at least ***20% more load.***

The ***most practical*** stone car ever seen.

ENDURANCE?

100,000 TONS

of stone were handled by a quarry man with Easton Won Way dump cars converted by us from his old cars, at an expense of not over

$12.00 FOR CAR UPKEEP

SUPPLIED COMPLETE OR YOUR OLD CARS REBUILT

We supply Easton Won Way Dump Cars complete, or at small expense, convert your two-way, four or five-yard dump car into one that will give you long, efficient service and a ton greater capacity. Rebuilt better than new with steel or wooden bodies on your present running gear. Won Way cars are easily, quickly safely dumped by ram, air hoist, or friction drum. Write today for detailed proposition.

EASTON CARS Trade Mark

EASTON CARS Trade Mark

44 DEY STREET, NEW YORK. WORKS AT EASTON, PA.

CHICAGO BOSTON DETROIT PHILADELPHIA PITTSBURGH ATLANTA CLEVELAND

2141-E

EASTON CAR & CONS'T'N CO.

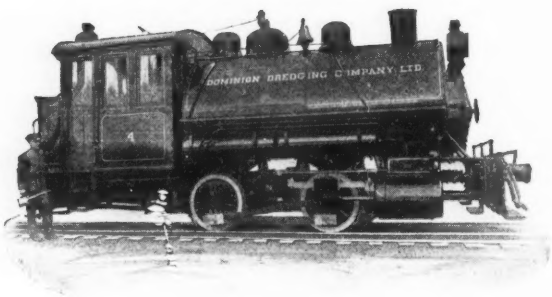
Always on Top

Vulcan Locomotives

CONTRACTORS have no trouble in coming out "on top" when Vulcan Locomotives are used.

Not only are you sure of avoiding loss due to haulage delays, but the reserve power and the design of Vulcan Locomotives enable you to improve on your estimated haulage time.

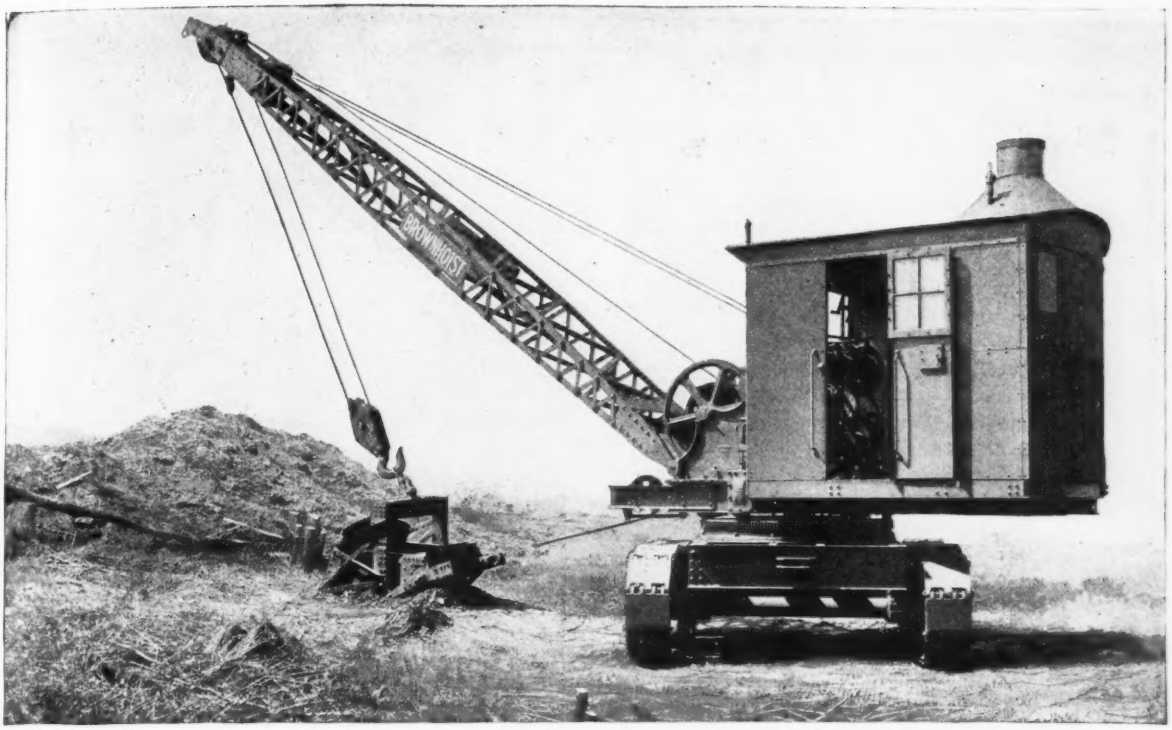
No matter in what class of work you specialize, there is a Vulcan Locomotive that will fit your requirements. Tell us what they are and let us submit details.



VULCAN IRON WORKS

Established 1849

1753 Main Street Wilkes-Barre, Pa.



Brownhoist No. 2 Locomotive Crane on Creeper Trucks with Brownhoist Dragline Bucket

Brownhoist method is 50% cheaper

That is what the Long Island Railroad, Jamaica, Long Island, say about their Brownhoist Locomotive Crane. Their first crane was purchased in 1910. Since that time so many new jobs have been found on which a Brownhoist saves money that they are now operating four cranes.

These cranes are used mostly on construction work along the right of way. As on many other jobs, their chief economy lies in the fact that they are self-propelling units which can travel anywhere with a load. Brownhoist cranes are built with creeper trucks, traction wheels or railroad trucks. They operate by steam, electricity or gas engine.

The fact that companies similar to your own are saving money with Brownhoists makes us feel sure that you could do the same. May we send you a copy of our catalog K? It shows how many companies are cutting costs.

The Brown Hoisting Machinery Co., *Cleveland, Ohio*

Branches: New York, Chicago, Pittsburgh, San Francisco, New Orleans.

Other Products—Buckets, Electric Hoists, Overhead Cranes, Bridge Cranes, Heavy Dock Machinery, Bins.

BROWNHOIST

MATERIAL HANDLING MACHINERY

When writing advertisers please mention ROCK PRODUCTS

The DU PONT Company announces a new explosive

IN their laboratories and in the field, Du Pont chemical engineers are always striving to make Du Pont explosives more efficient and more economical for your needs. The latest result of their efforts is this new dynamite—Dumorite—an explosive which has approximately the strength of 40% dynamite and is considerably more economical. This particular manifestation of Du Pont Explosives Service will save thousands of dollars to users of explosives everywhere.

1/3 more per dollar

DUMORITE—the new Du Pont dynamite—is a guncotton-nitroglycerin dynamite which

1. Gives over ⅓ more work per dollar
2. Will not cause headache
3. Will not freeze in any temperature

Dumorite has approximately the same strength as regular 40% dynamite. Under ordinary conditions it does the same work, stick for stick.

40% dynamite is packed with 100 1¼ x 8 cartridges to the 50-lb. case. Dumorite has 135 to 140 cartridges to the 50-lb. case. The price is the same per case.

In Dumorite you get over ⅓ more cartridges—over ⅓ more work per dollar. In other words, your dynamite dollar is worth $1.35.

Dumorite is now being used successfully for most types of blasting work. The Du Pont Explosives Service Department is ready to work out the adaptation of this money-saving explosive to your particular operations. We suggest that you write our nearest branch office giving your requirements.

Branch Offices:

Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Denver, Colo.
Duluth, Minn.
Huntington, W. Va.
Kansas City, Mo.
New York, N. Y.
Pittsburgh, Pa.
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Du Pont Products Exhibit
Atlantic City, N. J.

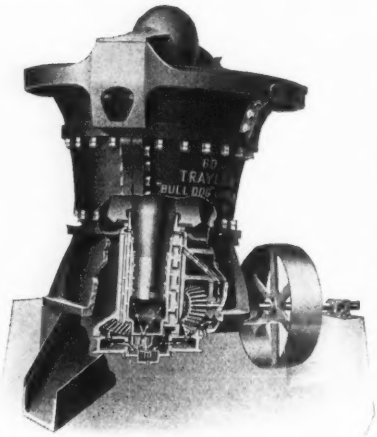
E. I. du Pont de Nemours & Co., Inc.
Explosives Department, Sales Division
Wilmington, Delaware

NON-HEADACHE DU PONT NON-FREEZING

DUMORITE

TRAYLOR "Bulldog" Crushers

Strong Where Other Crushers Are Weak



Practical Proof—

The practical proof of our success in lowering costs and increasing production, is found in the records of firms who are employing either our Bulldog Jaw or Gyratory Crushers.

Long experience, and accurate knowledge of plant requirements enables us to design and build simply and strongly, and with the staying quality that gives our product a range of effortless performance that is phenomenal.

The Bend-Proof Shaft, the Hewes Spider, the Cut-Steel Gears that run in oil, the perfect force feed lubricating system and the self-aligning Eccentric Journal in Bulldog Gyratory Crushers all lend their aid to a greater output for less power per ton.

TRAYLOR TRUCKS

with the new co-operative spring suspension ride like the finest touring cars. Let us show you how it will cut dollars from your trucking costs.

Traylor Engineering & Manufacturing Co.

Main Offices and Plant: ALLENTOWN, PA.

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New York 30 Church Street Los Angeles Citizens Bank Bldg.

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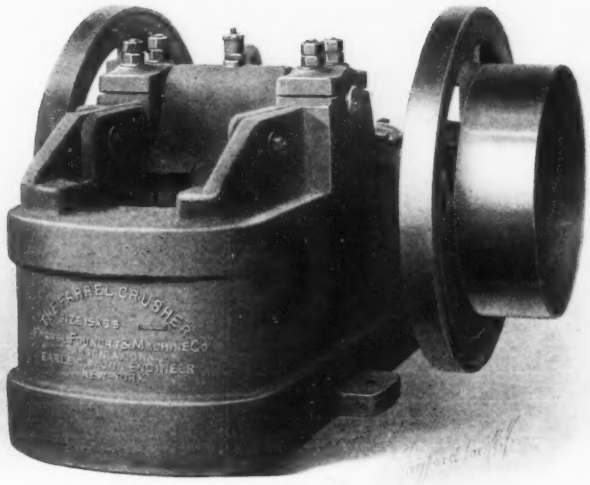
FARREL
JAW CRUSHERS



A battery of six Farrel Jaw Crushers are used to crush Trap Rock at the plant operated by the Delaware River Quarry and Construction Company, at Lambertville, N. J.

These crushers have proved to be the final word in economy and efficiency. The day after day service they have rendered in crushing this hard, tough material, has demonstrated their value and ability to withstand the hardest kind of usage.

If you have a real crushing problem it will pay you to consult with us. We design and equip complete crushing, screening and washing plants for stone, gravel, ore, etc.

Mechanical Tower Dryers.

Send for Catalogue

EARLE C. BACON, Inc., Engineers

26 Cortlandt St., New York, N. Y.

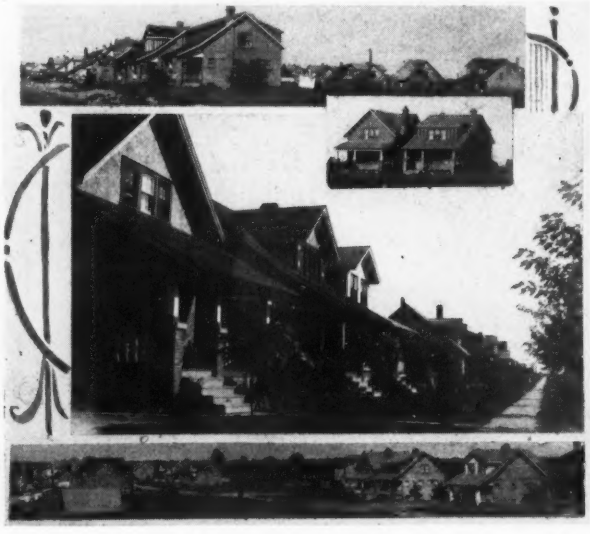
SHOPE BULLETIN

VOL. I February 11, 1922 Number 12

Evidence—

The engraving on this page shows several views of a development at Ford City, Ont., Canada. There are altogether 150 houses on this property, every one of them built of Shope Brick.

Think over all the advertising you have read concerning brick machinery, and then, if you can, recall one instance where they have shown more than an occasional building where the product of their machine has been used.



We have the best brick proposition on earth. Shope Bricks are guaranteed under every known test of building codes. They are waterproof, fireproof, permanent in color, and the basic patents give the licensee a monopoly in his territory thus eliminating ruinous competition, and protecting the investment.

If you have any concrete aggregates that are available, you are the logical producer, and it will pay you to get in touch with us at once. Now is the time, the building season will soon be with us.

Hasten your inquiry—or your territory may be grabbed off
Write for complete information

Shope Brick Company

361 East Morrison Street Portland, Oregon

LICENSEES:

The Miles Co.---Salem, Ore.
Eugene Concrete Co.---Eugene, Ore.
Wastenburg Brick Co.---Klamath Falls, Ore
Arizona Shope Concrete Brick Co.---Phoenix, Ariz.
Florida Nu-Tex Brick Co.---109 Water St., Tampa, Fla.
Texas Shope Brick Co.---3056 Sumpter Bldg., Dallas, Tex.
Birmingham Slag Co.---Birmingham, Ala.
Shope Brick Co. of Wisconsin---50th and State Sts., Milwaukee, Wis.
The Polychrome Cement Brick & Tile Co.---Carter-Cotton Bldg., Vancouver, B. C.
Dark Canyon Stone Co., H. W. Jones, Mgr., Rapid City, S. D.
Warren Sand & Gravel Co.---Easton, Pa.
Penn Shope Brick Co.---Reading, Pa.
Lycoming Shope Brick Co.---Williamsport, Pa.
Shope Brick Co.---Portland, Ore.
Rustic Brick & Supply Co., Palette Rd., Ford City, Ont., Can.
Puyallup Shope Brick Co.---Puyallup, Wash.
The Shope Brick Co.---Springfield, Mass.
Utah Shope Brick Co., P. O. Box 632, Salt Lake City, Utah
Decoration Brick Co.---1565 N. Lake Ave., Seattle, Wash.

These licensees are all successful manufacturers

The Haiss Creeper Loader

—Heavy enough to tackle any gravel bank
—Light enough to travel over soft ground

It's a fact—the Haiss Creeper is the most powerful of its type—and service has demonstrated that it is capable of digging against a bank of stiff clay—

And yet the big creeper threads distribute the gross weight to ***seven pounds a square inch.***

It will successfully negotiate soft or wet ground, railroad tracks, holes, rock and grades.

The Haiss Creeper Loader is simultaneously self-feeding, self-propelling and self-crowding—exclusive features that cannot be overlooked.

Let us tell you of all its advantages now!

The George Haiss Mfg. Company, Inc.

Established 1892

139th St. and Park Ave., New York, N. Y.

Representatives throughout the world

H-66

A Word With the Haiss Engineer

The Creeper Tread of the Haiss Loader has been designed with a view toward avoiding transmitting strain to main members of the loader when traveling over rough or broken country or soft, marshy ground.

The creeper is so constructed that it automatically absorbs all shock and strain in its own parts.

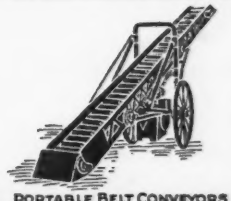
Watch this space for other features of the Haiss Creeper which the Haiss Engineer will explain from time to time.

TRUCK LOADERS

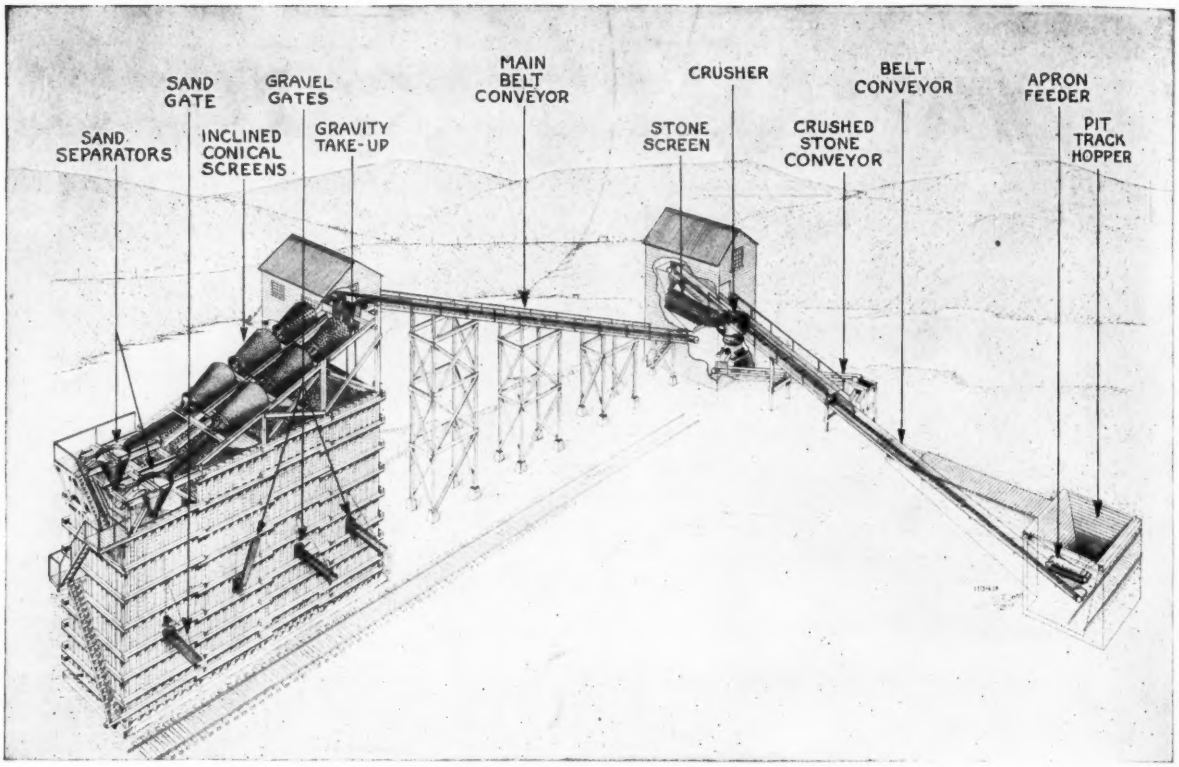
HAISS

MATERIALS HANDLING EQUIPMENT

CLAM SHELL BUCKETS



PORTABLE BELT CONVEYORS



To the Sand and Gravel Plant Operator

Link-Belt engineers have spent years in the study and development of methods for the efficient production of sand and gravel. Out of this experience they have learned what to do and how to do it.

We take full responsibility for the work from the start to the completion of the plant. The entire layout and design is by our own engineers and all the machinery is manufactured in our own modern shops.

Each Link-Belt plant is built to secure the greatest commercial advantages for its owners—whether the desired output be 10 or 300 carloads a day.

Each plant has its individuality, and the details of design make it the most efficient for its work, from every standpoint—economy of operation—high quality of material—simplicity—durability—reliability, etc.

Link-Belt screens, scrubbers, sand separators, excavators, spouts, gates, feeders, water pans, belt conveyors, bucket elevators, etc., are features of Link-Belt plants that earn dividends for their users.

If you contemplate additions to, or changes in your present equipment, or a new plant, why not put your problem up to our engineers?

Send for catalog No. 440.

LINK-BELT COMPANY 886

PHILADELPHIA—Hunting Park Ave. and P. & R. Rwy. CHICAGO—300 W. 39th Street

LINK-BELT

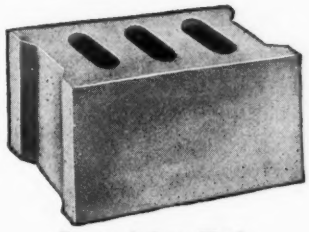
When writing advertisers please mention ROCK PRODUCTS

BABYLON

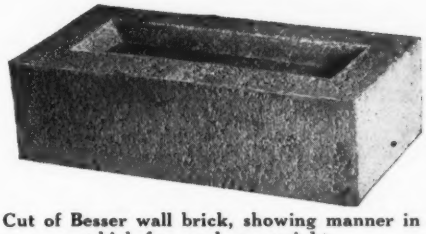
Would Have Been Standing TODAY Had It Been Built of

BESSER-Made Concrete Block, Brick or Tile

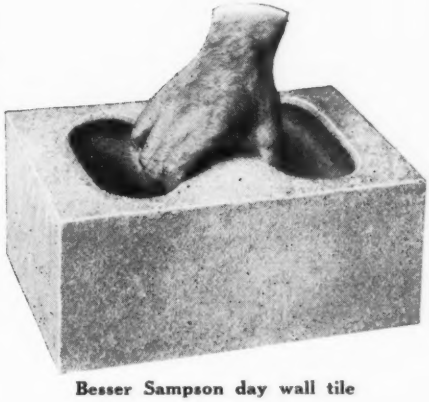
And Would Have Cost Far Less to Build



Besser 3-Core Block



Cut of Besser wall brick, showing manner in which frog reduces weight



Besser Sampson day wall tile

Instead, the building of it impoverished a nation and it is a dust heap.

Besser-made Concrete Building Units last till doomsday, and what interests **you** more **right now**—cost less of themselves and cost less to lay than other and less durable building material.

Besser Automatic Concrete Products Machinery has made possible this great improvement, and now Besser-made concrete building units are the standard for economy, uniformity, strength and durability.

Besser-made Block, Brick and Tile are the greatest business getters for a building supply concern, either in small town or large.

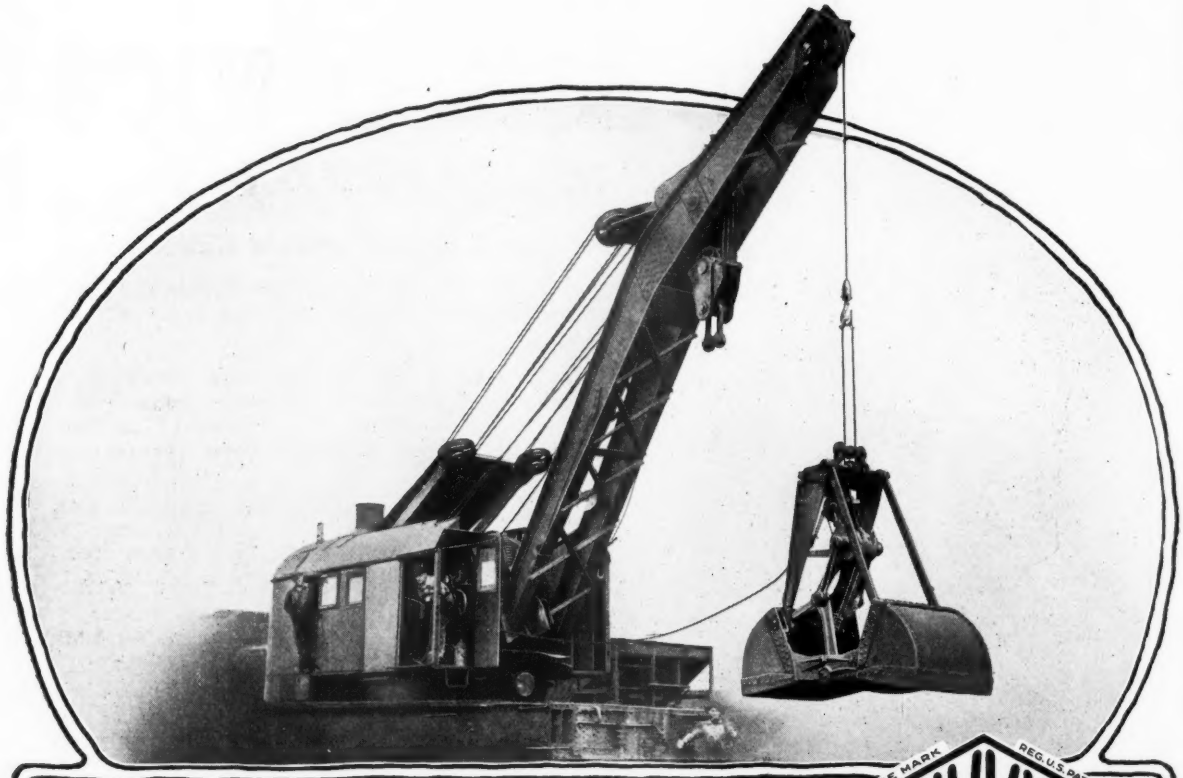
Just what is *your* demand? Let us study your market with you. Our Engineers can be of service—no obligation to ask.

BESSER SALES COMPANY

Complete Equipment for Concrete Products Plants

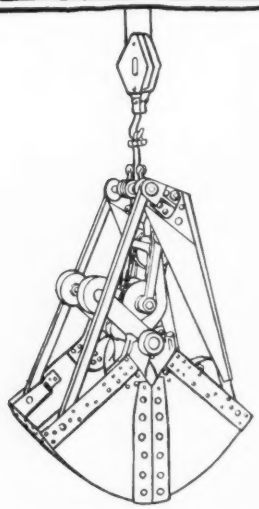
349 Monadnock Building **CHICAGO**

Better Own a BESSER *Than Compete With One*



SINGLE LINE (Hook On) BUCKETS

TRADE MARK BLAW-KNOX REG. U.S. PAT. OFFICE



HAVE a Blaw-Knox SINGLE LINE Bucket handy—ready to hook on to your crane and pounce onto any rehandling job.

No time wasted in reaving buckets—no crane delays—no tieups of any kind. Just throw the yoke of the bucket closing line over the crane hook and go to work.

Only a single hoisting drum is required for complete operation.

The SINGLE LINE'S ability to handle sand, gravel, coal, ore, slag, etc.—coupled with its adaptability to all kinds of cranes, derricks and hoists—makes it invaluable to the user who devotes his crane time to bucket work only intermittently.

The SINGLE LINE is an ever ready bucket—made in sizes from ½ yard capacity and up. It will be our pleasure to investigate any rehandling or digging difficulties which you may have, and suggest a **bucket** remedy.

Blaw-Knox Buckets are made in all sizes—single line, two line, three line or four line—for every digging, dredging, and rehandling requirement.

BLAW KNOX

TRADE MARK BLAW-KNOX REG. U.S. PAT. OFF.

PITTSBURGH, PA.
619 Farmers Bank Bldg.

COMPANY

New York-Boston-Chicago-Detroit-Baltimore
Birmingham-San Francisco-London, Eng.

Portable Air Service

MAKE YOUR AIR WHERE YOU USE IT

Ingersoll-Rand Portable Compressors

are complete and always ready. Connect up the air tools, crank the engine (or throw the switch) and the work begins.

Nothing is lacking in the Ingersoll-Rand Portable Compressor plant. Compressor, air regulator, tractor type gasoline motor, radiator cooling water system, fuel tank, air receiver with safety valves, and accessories are all mounted on a single steel truck.

When the day's work is over the covering can be attached and the entire plant is protected from the weather. When the location of your drilling changes, a team, truck or tractor will move the compressor to its new location.

And bear in mind—this portability is not secured at the expense of operating efficiency. A study of the details of Ingersoll-Rand Portable construction will tell you why.

Ingersoll-Rand Portable Compressors with gasoline engine drive are built in three sizes: 45 cu. ft., 118 cu. ft. and 210 cu. ft. Electric motor driven outfits are built in 45 cu. ft. and 118 cu. ft. capacities.

Let us send you a copy of Bulletin 3315

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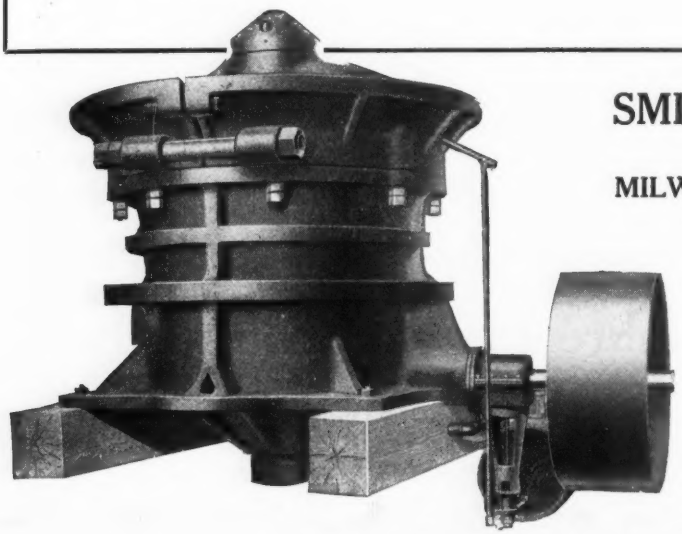
TELSMITH GRAVEL WASHING PLANTS

Have you seen a Telsmith plant work? If not, take a look at one of these outfits: Russell Bros. Co., Duluth, Minn.; Woodbury County Gravel Pit, Correctionville, Ia.; Robbins-Young Co., St. Paul, Minn.; Central Michigan Gravel Co., Lansing, Mich.; A. H. Prange, Grand Rapids, Mich.; Cook-Richards Co., Crosby, Minn.; Crystal Lake Crushed Stone Co., Sheboygan, Wis.; Salem Sand & Gravel Co., Wilkes-Barre, Pa.; Crawford Sand & Gravel Co., Meadville, Pa.; Kerr & Murphy, Connersville, Ind.; City Gravel Pit, Red Wing, Minn.; Fayette Sand & Gravel Co., Washington C. H., Ohio; Beckwith Gravel Co., Lansing, Mich.

Most of these plants were designed by Telsmith engineers; and are equipped throughout with Telsmith machinery—Telsmith crushers, Telsmith bucket elevators, Telsmith belt conveyors, washing screens, feeders, sand tanks, bin gates. In each case, the buyer got a well designed plant, suited to his local conditions, with all elements in good balance and properly "hitched up." Every one of these outfits made good right off the bat—as might be expected of Telsmith equipment.

The list is only a short one. A complete list of Telsmith installations would resemble a husky young directory. We'd like to add your name to our roster of successful Telsmith installations. Just drop us a line and we'll send you our general bulletin G. P. 11.



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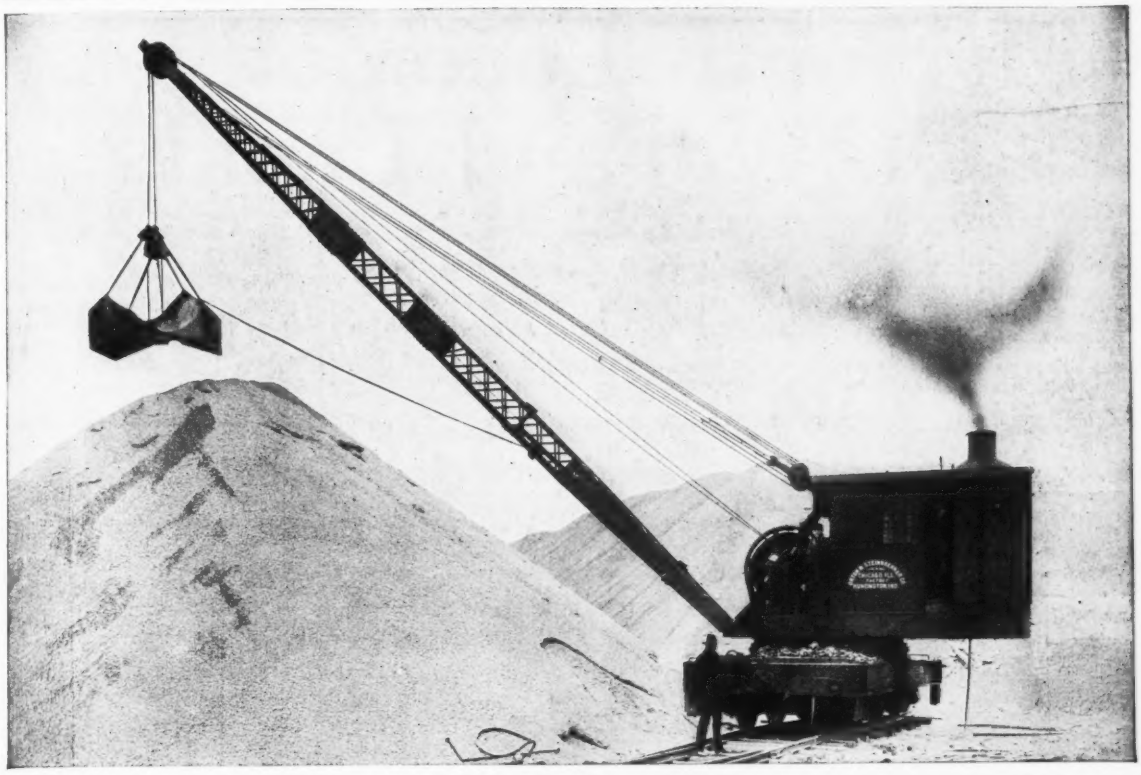


30-TON CRANE
With 60-ft. boom and 2-yd. bucket

O. S. DEPENDABLE

LOOK at the problem squarely—Some day you will use O-S-Dependable Cranes and Grab Buckets and forever after you will be a defender of their merits.

The material handling machinery made by Orton and Steinbrenner Co. is not "just suitable." It is unsurpassed for simplicity and accessibility. The quality of the material and workmanship insures a rare economy of performance.

Our booklet on this subject is profusely illustrated with photos of our cranes on the job and contains a world of information concerning details that are far beyond the space limitations of this advertisement.

It will be sent to you on request

Orton & Steinbrenner Company

CHICAGO

Factory—Huntington, Ind.

Plymouth Locomotives On Welland Canal

Statistical

Welland Canal connects Lakes Erie and Ontario, whose difference in level is 326 ft.

Canal crosses the Niagara Peninsula about 10 miles west of Falls.

Length of Canal, miles	25
Number of Locks	7
Usable Length, feet	800
Usable Width, feet	80
Lift of Locks, feet	47
Width on Bottom, feet	200
Width at Water Line, feet	310
Depth of all Structures, ft.	30
Time to fill Locks, minutes	8
Vessel to pass thru Canal, hours	8
Number of Bridges	22

Estimated cost at 1912 prices was $50,000,000.

FOUR PLYMOUTH Gasoline Locomotives are a part of the equipment of Doheny, Quinlan & Robertson, who have contract for excavation and cement construction of a section of the Welland Canal—the world's biggest project now in work.

The camera shows two Plymouths, handling large cars and massive buckets filled with wet batches to be hoisted and poured into the great forms of the retaining walls. Ask us for Literature.

The Fate-Root-Heath Co.
Plymouth, Ohio, U. S. A.

Historical

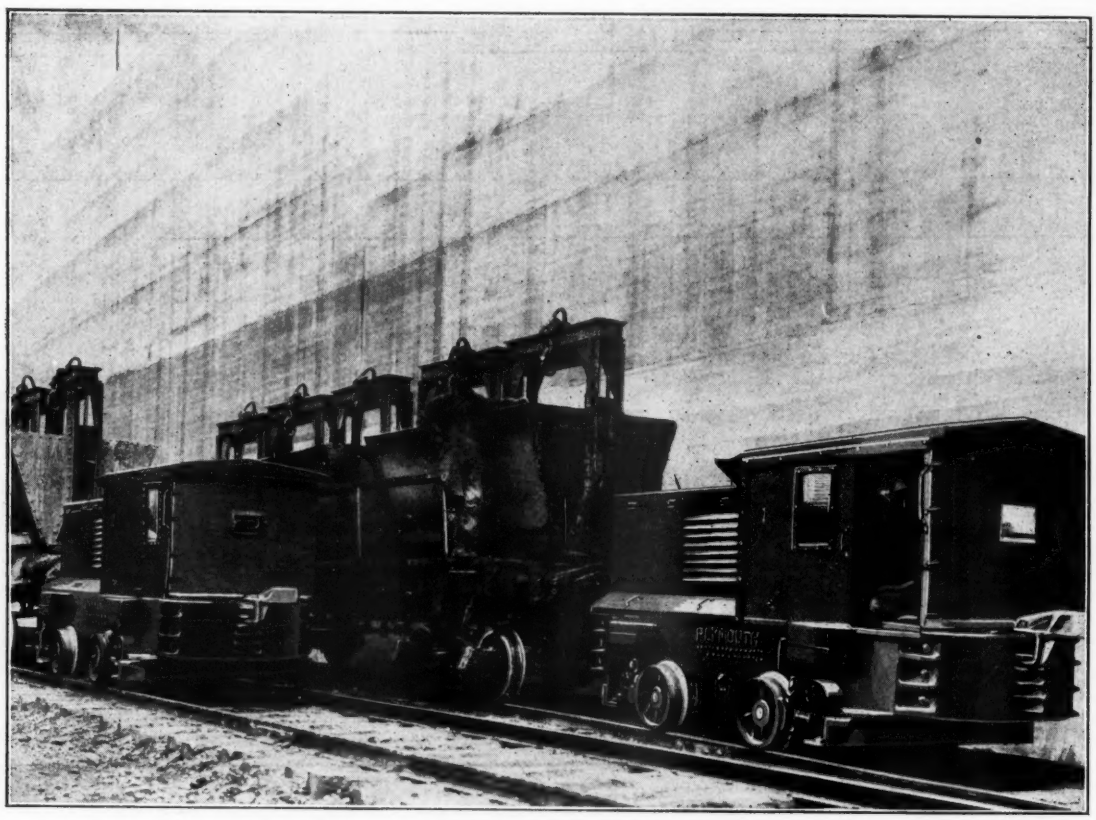
First canal completed in 1829. Connected by feeder canal in 1835. Had 40 locks, 110 feet long and water depth 8 feet.

Second canal opened in 1845. Locks reduced to 27, each 150 feet long and 27 feet wide, 9 feet deep. Cost $7,693,824.03.

Third canal opened for traffic 1887, with locks 270 feet long, 45 feet wide and 12 feet deep.

Third canal cost to April 1, 1919, for construction $23,337,403.16.

Fourth canal now building is reflected in panel opposite, and has capacity to admit ocean steamers to Great Lakes ports.



Rock Products

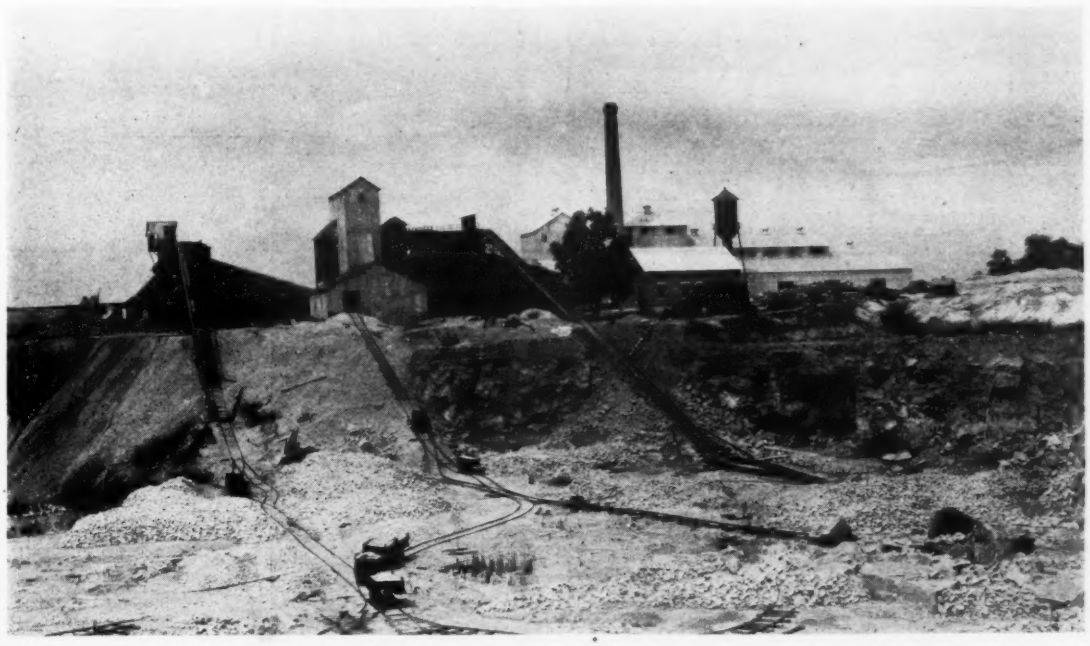
Volume XXV | Chicago, February 11, 1922 | Number 3

Kelley Island Company's Lime Plant at Gibsonburg, Ohio

Hydrating Plant Destroyed by Fire in 1920 Is Completely Rebuilt — Is of Concrete and Steel Construction Throughout

THE Kelley Island Lime and Transport Co. was organized in 1885 by Caleb B. Gowan, who was its first president, for the purpose of burning lime, crushing flux, stone and quarrying riprap for harbor and breakwater work along the Great Lakes. Since that time the company has expanded until at the present time it is operating 13 plants. The Gibsonburg (Ohio) plant, which was practically destroyed by fire on October 23, 1920, has been completely rebuilt.

This plant, which has been in operation about 21 years, was originally owned and operated by the Ohio and Western Lime Co., the present company assuming control in April, 1917.



General view of plant. New hydrate unit to right of old battery of kilns

The Quarry

Normally about 35 men are employed in the quarry, which produces limestone for a crusher plant as well as for calcining. The working face in the quarry is now about 40 ft. A complete new track layout has been planned. The accompanying illustrations show the general arrangement at the present stage of development.

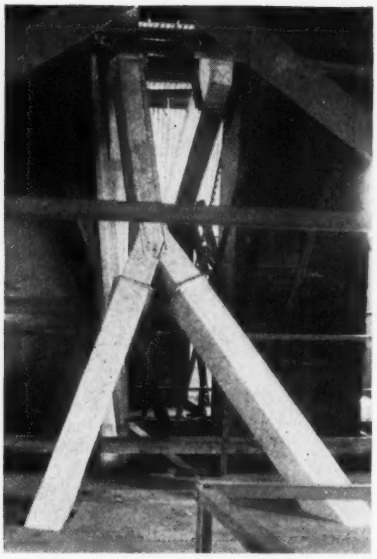
Kilns

The 22 kilns, of the straight stack type, are in two batteries, 12 of which are built of stone. The other 10 are steel, set parallel to the older battery and at the extreme end of the plant. The average output from each kiln is about 8 tons per day, giving a plant capacity of from 175 to 200 tons of lump lime daily. This limestone is dolomitic and slow burning.

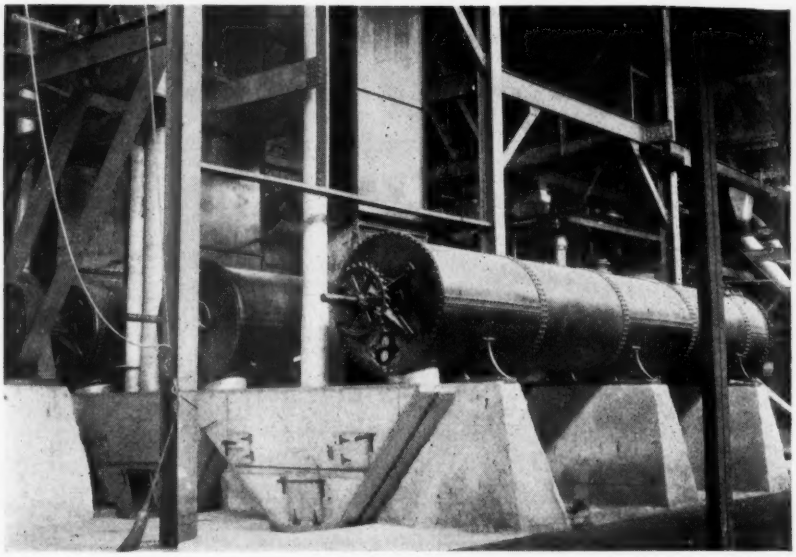
A pan conveyor running through the middle of the cooling floor delivers the lump lime to a Sturtevant rotary crusher where it is reduced to ¾ in. From the crusher the lump lime is elevated to a bin of 150 tons' capacity.

Hydrators

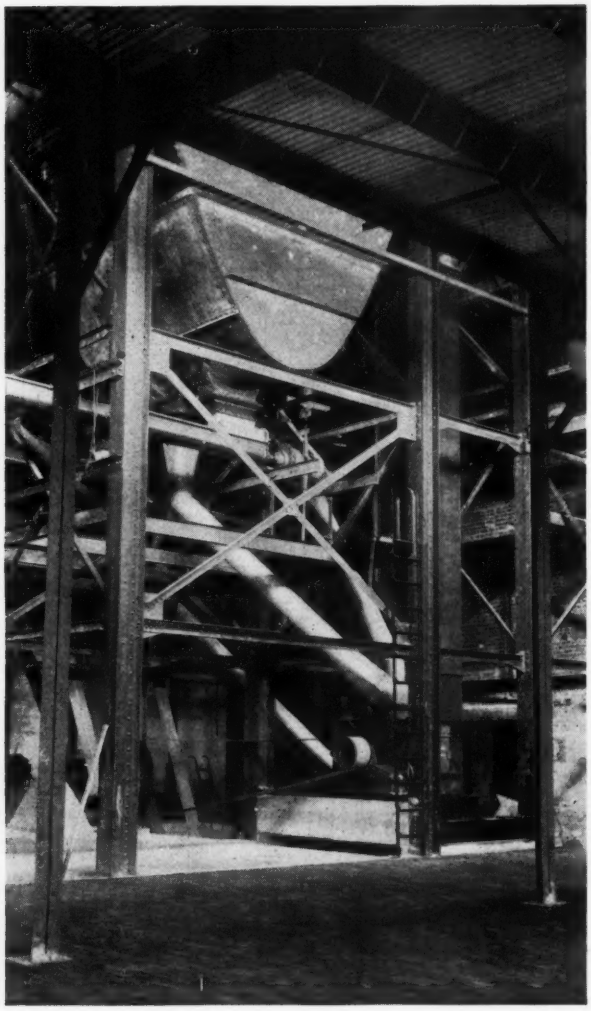
The crushed lime is fed from the storage tank to three hydrators by feed rolls, thus insuring accuracy in the amount of lime fed to the hydrators. The water supply is also accurately controlled by graduated cocks and by a constant water pressure.



Y-spout through which crushed lime is discharged to hydrate storage bins



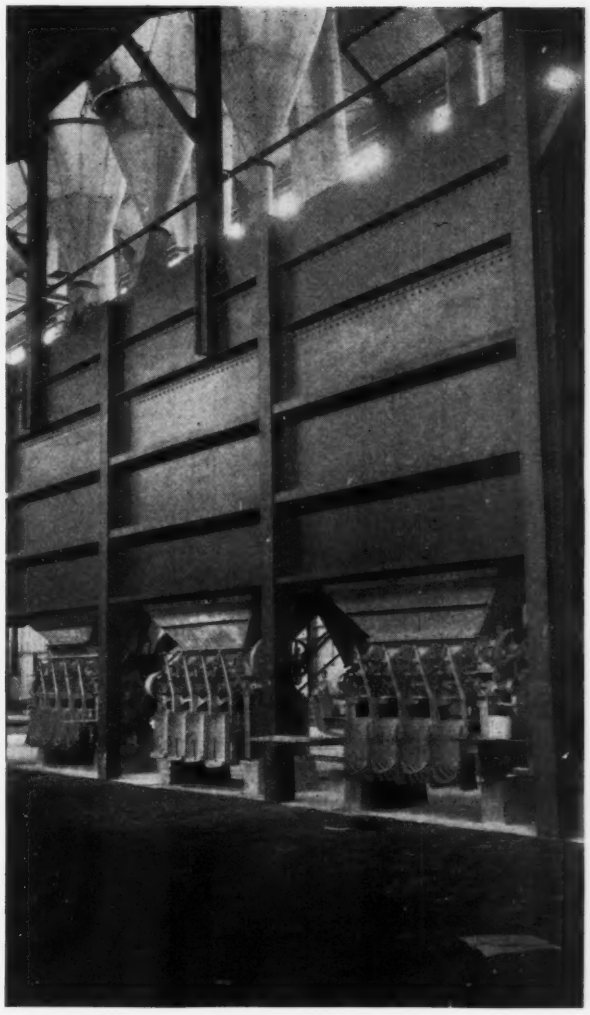
Battery of hydrators. These are charged with lime by feed rolls and with water from a constant-pressure tank



Raymond feed rolls supplying hydrator. Ground lime storage bins showing feed to Pennsylvania mill

A 12-in. screw conveyor delivering to flexible spout, loads agricultural lime directly into cars

Battery of Raymond mills and individual supply bins



Bates valve-bag packers and finished hydrate storage

Housed drying conveyor. The vent stacks may be seen extending from the housing top to the roof

Crushing plant and storage capable of holding 400 tons of crushed stone

Constant water pressure is obtained by means of a pressure tank and a constant level float valve. The pressure tank is supplied from a 20,000-gal. outside tank.

Frank Ottney, mill foreman

The hydrator is a tubular casing 27 ft. long and 4 ft. in diameter, with a square shaft operating at 10 r.p.m. and carrying 84 cutting paddles, passing through it lengthwise.

Drying Conveyors

The hydrators discharge into an elevator which carries the hydrate to two sets of drying conveyors above it. When all three hydrators are running, the entire output of each outside hydrator is delivered to the two drying conveyors and the output of the third hydrator is divided between them.

Each drying conveyor is housed and has provision for the admission of warmed air at the bottom; the vapor passes through vent stacks at the top. There are four sections of drying conveyor in each housing, one above the other, alternate sections running in opposite directions. Hydrate from the elevator is discharged into the top conveyor and carried to the opposite end, where it drops to the second conveyor, which travels in the reverse direction.

From the drying conveyor the hydrate drops into a cross conveyor discharging into a hexagonal screen. A screw conveyor carries the finished product from the hexagonal screen to a series of four bins. There are two discharge spouts from the conveyor into each bin.

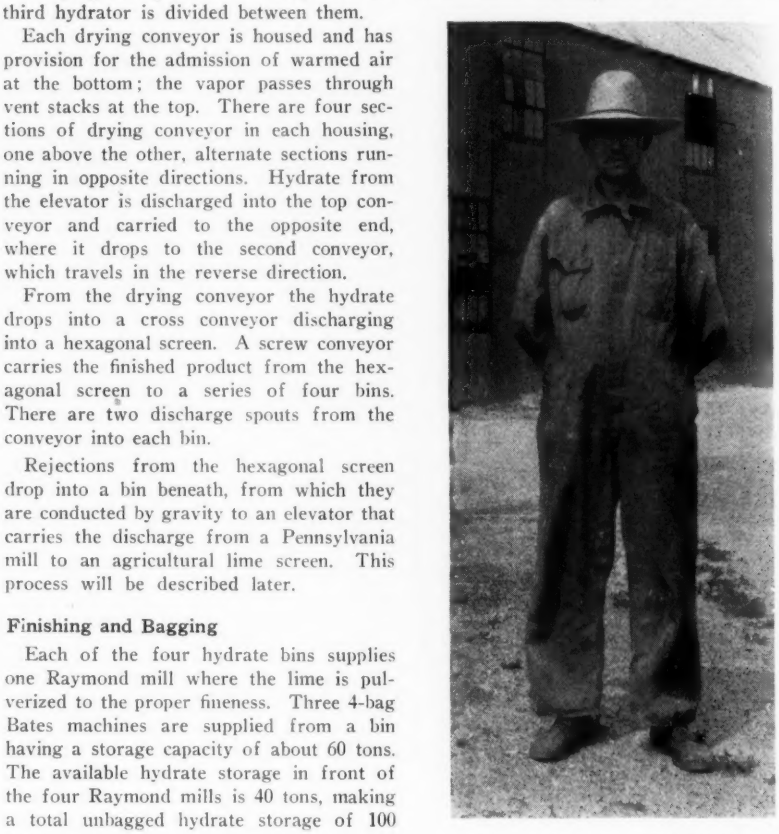
Rejections from the hexagonal screen drop into a bin beneath, from which they are conducted by gravity to an elevator that carries the discharge from a Pennsylvania mill to an agricultural lime screen. This process will be described later.

Finishing and Bagging

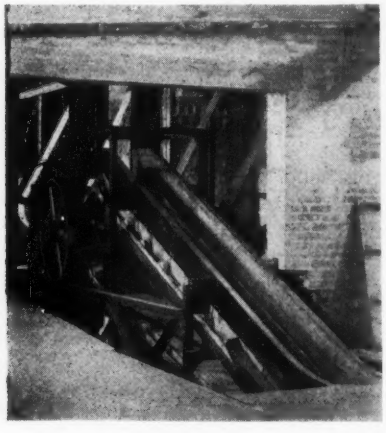
Each of the four hydrate bins supplies one Raymond mill where the lime is pulverized to the proper fineness. Three 4-bag Bates machines are supplied from a bin having a storage capacity of about 60 tons. The available hydrate storage in front of the four Raymond mills is 40 tons, making a total unbagged hydrate storage of 100 tons.

A convenient feature of this plant is the provision for disposing of the rejections from the Raymond mills and the spill from the bagging machines. Rejections from the mills drop into a 6-in. screw conveyor, then elevated into a waste tank, and at intervals loaded into a wagon by means of a gravity spout.

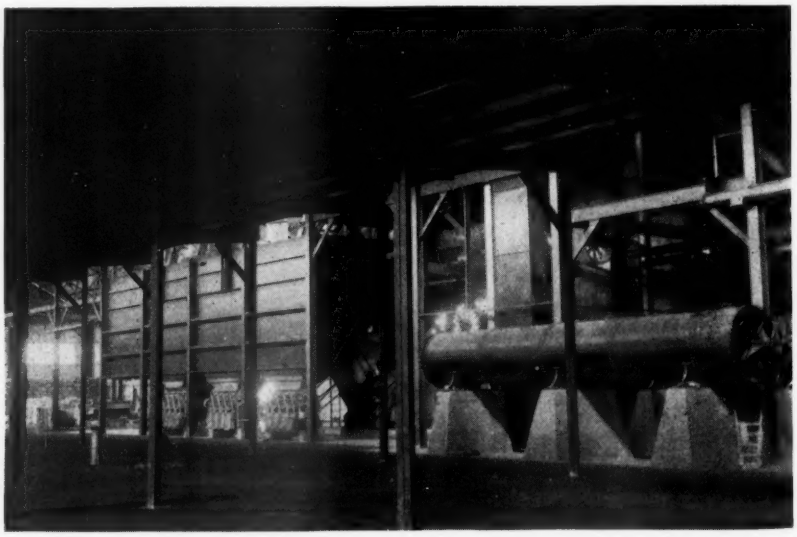
The spill from the bagging machines is forced into the same conveyor at the close of the day's work and then elevated to the bin supplying the last Raymond mill. A divided spout permits this double use of the same conveyor. Not more than five minutes a day is required for this clean-up.



J. H. Mutchler, superintendent



Conveyor from cooling floors to Sturtevant mill



Arrangement of hydrating and bagging units. Note the abundance of space and light

Agricultural Lime

For manufacturing agricultural ground lime the material from the crushed-lime bin is fed to a Pennsylvania hammer mill, reclaimed by a bucket elevator and then delivered to a housed hexagonal screen, from which the sized lime goes to a 90-ton storage bin where it is loaded on railroad cars. The screen rejections are then returned to the hammer mill and the process is repeated.

Rejected material from the hydrate screen, instead of being discharged directly to the hammer mill, is discharged into the elevator running from this mill to the agricultural lime screen. Such part of the material as will not pass this second screen is returned to the mill for grinding.

Agricultural lime is loaded from the 90-ton bin by a 12-in. screw conveyor. As the drop from the conveyor to the car floor is about 18 ft., the cars can be trimmed by the spout. The storage bin for agricultural lime saves many delays in loading that are unavoidable when the loading is done directly from the mill. The hydrate and agricultural lime are loaded on the same track; otherwise, it might be necessary to hold up the loading of hydrate until the agricultural lime could be ground.

Power House

The entire plant is belt driven from an 18 x 42-in. horizontal Corliss engine. An Ingersoll-Sargent steam air compressor supplies the air necessary for the quarry operations. Two 125-hp. and one 150-hp. horizontal tubular boilers at 125-lb. pressure generate the steam for the Corliss engine and also for three steam hoists that operate the haulage systems for the two batteries of kilns and the crusher plant. Water for the plant is pumped from a reservoir in one part of the quarry into a 20,000-gal. tank, shown in one of the illustrations. The main drive belt is completely housed in on the mill-side of the engine room. The belt has been in service in this plant for 16 years and is apparently in first-class condition.

New Buildings

The complete hydrate mill, a concrete block shop and store room, and a limestone crushing and screening plant and bins, were also newly built. The hydrate mill building has steel framework, with sheet-steel walls and roof. The floor is of creosote block, laid on a 6-in. concrete base, except around the machines, where the floor is of solid concrete. The illustrations of interior indicate the size of the building and its excellent lighting. Large bag-storage space is provided across one entire end and along the side of the building adjacent to the loading tracks. The stairs, walks and ladders are also of steel, practically no wood being used in this part of the plant.

The new 28 x 42-ft. shop and store room, located between the hydrate mill and the quarry, is built of concrete block, divided by a concrete block wall into two rooms, the shop end being 28 x 28 ft. The remainder is to be used for storing mechanical supplies.

The Crusher Plant

A 60-hp. Atlas steam engine operates the entire crushing and screening plant, with the exception of the haulage system, which is operated by a separate steam hoist.

Square box cars, built by the company, deliver the stone to a No. 5 gyratory crusher. The discharge from the crusher is delivered to a 16-ft., three-jacket screen by a pan elevator. Underneath the screens are four 100-ton capacity steel bins. Provision has been made for loading both the cars and the wagons at the same time.

The company has confined its efforts to producing various kinds of high grade finishing lime at this plant, but last summer it erected a crusher for the purpose of shipping dolomite stone for various uses. At present it plans to add a large crusher to make this one of its principal dolomite fluxing stone shipping points.

This hydrating plant is, the management considers, the most modern of its operations. Many new features were introduced by the entire organization, especially through the operating and engineering departments, and the results derived since the plant was put in operation proves the ability of G. J. Whelan, general manager; J. J. Sauvey, superintendent of construction; A. C. Schultz, engineer, and A. H. Mutchler, plant superintendent.

Lime in Cyanidation

IN CONDUCTING cyanide tests recently it was found that small variations in the quantities of lime used had a marked effect upon the extraction of the gold. Has anyone in a similar experience been able to attribute the cause? asks Ernest Gayford in the *Mining and Scientific Press*.

This ore assayed as follows: Gold, 1.205 oz.; silver, 1 oz. per ton; insoluble, 92.4 per cent; and iron, 2.6 per cent. It was a clean free-milling material with a small percentage of sulphur combined with the iron. Some of the tests:

Lime lb. per ton	Where used	Crushing Mesh	Hours agitated	Tailing Gold, oz.	Assay Silver, oz.	Density	KCN in solution lb. per ton
2	In agitator	65	16	0.06	0.3	3:1	2.9
4	" "	65	16	0.44	0.4	3:1	2.9
6	" "	65	16	0.71	0.5	3:1	2.9
2	" "	65	24	0.055	0.30	3:1	3.0
2	" "	65	36	0.05	0.25	3:1	3.0
5	" ball-mill	65	16	0.57	0.30	1:1	2.0
7	{5 " " / 2 " agitator}	65	16	0.57	0.30	1:1	2.0
5	" ball-mill	100	16	0.55	0.25	1:1	2.0
3	{5 " " / 2 " agitator}	100	16	0.59	0.20	1:1	2.0
2	" ball-mill	100	16	0.03	0.20	1:1	2.0
7	{2 " " / 1 " agitator}	100	16	0.17	0.20	1:1	2.0

The condition varied at one time was the quantity of lime and that in the last two tests a difference of only 1 lb. of lime per ton of ore made a difference in the gold extraction of $2.80 per ton, whereas the silver extraction remained constant. When 5 lb. of lime per ton was used the tailing jumped up to $11.40.

At a Tonopah mill the lime content is closely watched, it having been proved by a working scale as well as a laboratory test that extraction is very erratic, due to re-precipitation when either too high or too low alkalinity is carried. The lime is maintained between 1 and 1.5 lb. of CaO per ton of solution.

While it was found that the lime caused re-precipitation, no reason could be ascertained. Mr. Gayford could not follow the re-precipitation theory because the silver extraction remained practically constant whatever amount of lime was used, while the gold extraction alone varied.

Chickens Require Lime

THE "WHY-FOR" of limestone chicken grits is explained in Bulletin 323 of the Wisconsin Agricultural Experiment Station, as follows (according to an abstract published by the National Lime Association):

Chickens are no different from other animals in respect to their requirement for an adequate supply of lime compounds for growth. Halpin and Hart of the poultry department of the University of Wisconsin, have made a study of this subject, beginning with chicks having a weight of approximately a quarter of a pound. These chicks failed to grow on any of the grain or grain supplements with protein concentrates unless the concentrates were of such a type as to carry an abundant mineral supply, including calcium salts.

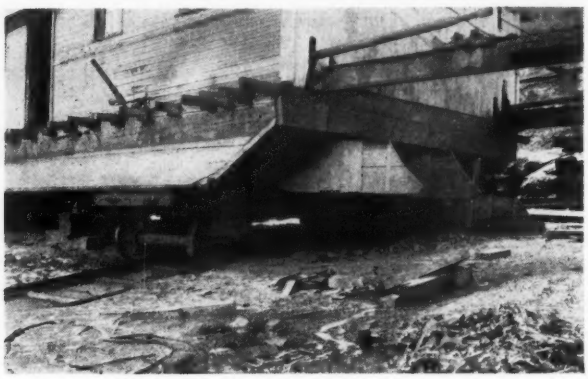
In another study were chickens weighing from one to two pounds. With them it was found that when fed with corn, grain, gluten meal and common salt only the chicks died early.

Hints and Helps for Superintendents

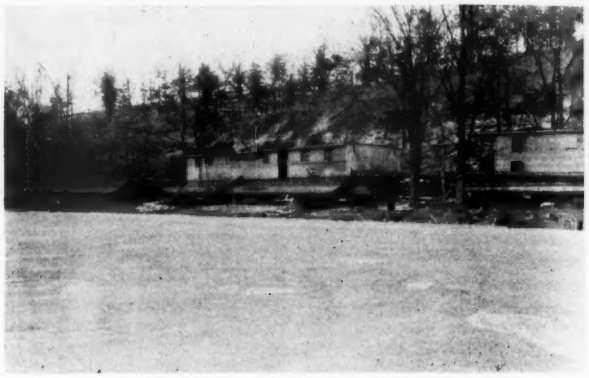
Dry Dock for a Sand Dredge

DOCKING a sand and gravel dredge at the close of the season for repairs and overhauling is sometimes difficult. There are many ways of accomplishing this job. Here is one way that is reasonably efficient and economical: As the accompanying photographs show, there are two trucks, 6-ft. gage, traveling down the rail incline into the river. In order to keep the truck level at all times, the wheels are of different diameters; in this case one axle having 24-in. wheels, the other 12-in. wheels. The truck frame is 18 ft. long and 8 ft. wide and the degree of inclination of the rails such that the truck frame is level at all times. The rails are set on a concrete foundation and measure 60 ft. from point to point. Each truck is attached to an individual crab by wire rope. Thus, when a dredge is to be dry-docked the trucks are let down into the water, the dredge floated on the trucks, which are then hauled up by the action of the crab. The dredges are put back into the water by the self-same method.

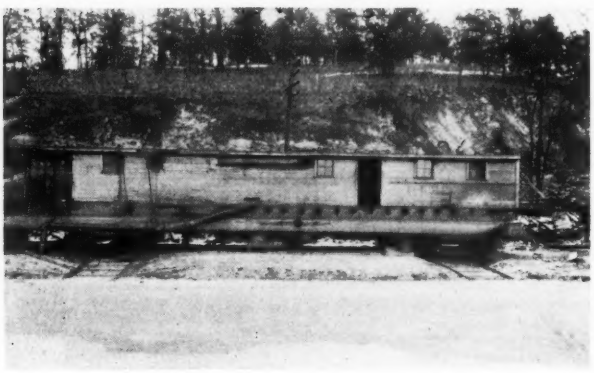
This method of docking is found at the plant of Larimer & Schaefer, Cedar Rapids, Iowa. It is entirely "home-made" and Mr. Larimer says it is satisfactory.



Position of trucks underneath the dredge



Winter scene at Larimer & Schaefer's dock



Sand dredge in dry dock undergoing repairs

One of the crabs used for hoisting trucks

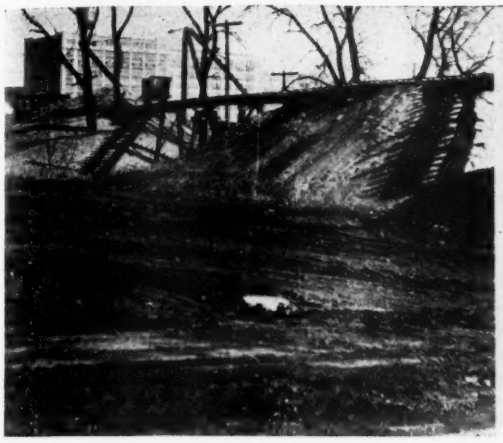
Unique Storage System

THE accompanying photographs show a method of storing sand and gravel over the winter months at the plant of Lorimer & Schaefer, Cedar Rapids, Iowa. It consists of a trestle 19 ft. above ground, 230 ft. long and 4 ft. wide, with 36-in. gage track. An inverted V side-dump car distributes the material along the trestle. The operation consists of unloading sand from barges with a stiff-leg derrick and clamshell, loading it into the car and distributing along the trestle.

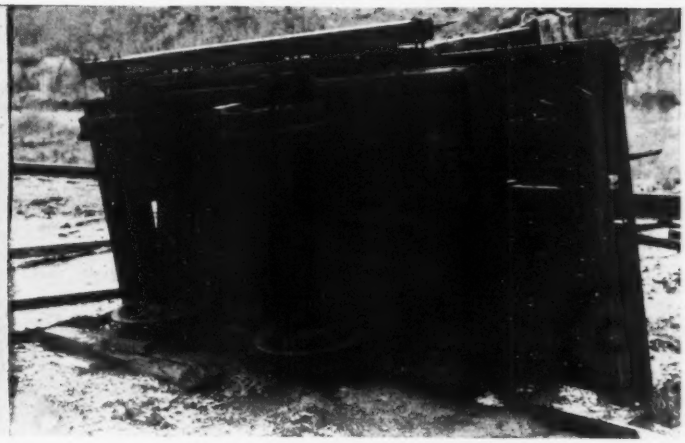
The construction of the car and its method of locomotion is very unusual. As one of the photographs shows, the car is equipped with chain brakes and the body is built on a frame made of channel iron. In the foreground can be seen two crosspieces of channel iron, through which an endless cable is run. The crosspieces act as a clamp controlled by a lever on the car platform. Thus the operation simply consists of clamping the wire rope when it is desired to move the car and unclamping and applying the chain brake to stop the car.

The body of the car has two hinged doors, one on either side, which are controlled by a chain operating on a ratchet and brake. Loosening the brake lets out the chain and the doors fly open. To close the doors the chain is wound on a shaft by simply operating the ratchet wheel.

Another interesting fact is that the endless cable by which the car moves is operated from a sheave attached to the slewing drum of the hoist operating the stiff-leg derrick and clamshell bucket. This sheave is always idle and so the cable is constantly in operation and requires no extra power other than what is needed to operate the hoist.



Car distributing sand over trestle



Under side of car showing brakes and rope clamps

Handy Material-Handling Chart

By W. F. Schaphorst, M. E.,
Newark, N. J.

HERE is a chart that will be found handy by the cement mill engineer, designer, or manager for quickly determining the capacity of material-handling machinery such as shovels, buckets, etc., knowing the number of cubic yards handled per cycle, the pounds or the tons, and knowing the time interval of each cycle. If the unit is not given in yards, pounds, or tons, any metric or other unit can be applied equally well and with equal rapidity.

Simply lay a straightedge across the chart, or stretch a thread across it, and the problem is instantly solved. For example, if in a given cement mill an excavator is to be employed to handle 8 cu. yd. of material per cycle and to be operated at a cycle of 45 sec., what will be the capacity of the excavator, assuming an efficiency of 90 per cent?

The dotted line drawn across the chart shows how the problem is solved. Run a straight line through the 8 cu. yd. (column A) and the 45 sec. (column C). The intersection with column B gives the answer as 13,800 cu. yd., which is as close as can be read with the eye. The exact number is 13,824 cu. yd., but 13,800 is certainly close enough for all practical purposes.

Inversely, the chart will be found useful for selecting a required excavator of any capacity up to 100,000 cu. yd. per 24 hr. If a certain capacity is desired and the yardage per cycle is known, the chart will give the minimum time that can be allowed for each cycle. Or, if the time of the cycle is known and the capacity of the shovel is known, the yards per cycle are easily determined. In other words, knowing any two of the factors, the third factor is easily and quickly determined.

The capacity of the chart is large enough to take care of any of the ordinary problems and most of the extraordinary ones. The yardage per cycle varies all the way from 0.2 to 20 yd.; the time of each cycle from 10 to 1000 sec.; and the capacity of the shovel from 20 to 100,000 yd. per day of 24 hr.

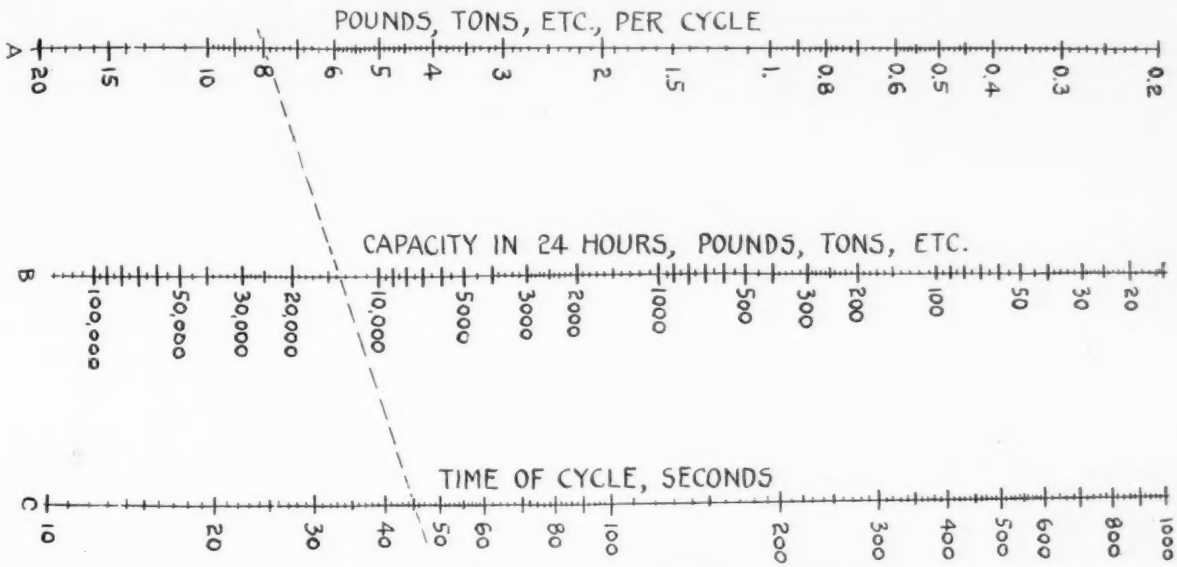


Chart for determining capacity of material-handling machinery

Automatic Aerial Tramway

Tramway at Clinchfield Products Corporation Operating a Barytes Mine at Evington, Va., Is Reversible—Hauls Both Coal and Ore

AT EVINGTON, VA., the Clinchfield Products Corporation, which operates a barytes mine, has in use an automatic aerial tramway which is unique in that it is used to haul both barytes ore from the mine to the railroad siding for loading into cars and to haul coal from the railroad siding to the plant, a distance of approximately 2850 ft.

Looking down on the discharge and loading terminal

The material is taken from a loading bin at the mine and discharged into 4 cu. ft. steel cars equipped with double-flanged wheels which run on two parallel wire ropes. The track ropes are of 1x9-in. cast steel tramway track cable and the traction ropes are 6x7-in. cast steel haulage rope. The cars are moved by an endless hauling or traction rope, to which they are attached by means of wire rope clips, and loaded and unloaded automatically while in motion so that the operation is continuous.

At the mine loading terminal the material is delivered to a storage bin, the flow from which is controlled by a hand-operated gate.

An automatic loader, which consists of a hopper holding just a tram car load, is placed just above the car tracks so as to receive the material from the bin gate, and when the hopper is full the bin gate is closed. The loader has a bottom discharge gate held in place by a latch, and this latch is tripped by the car as it approaches the hopper. The pressure against the gate forces it open and all the material in the hopper slides into the car as it passes underneath and then continues on its way fully loaded to the discharge terminal. After all the material has been discharged from the loader and the car has passed, the gate swings shut and the loader is ready for the next charge.

At the discharge terminal at the railroad siding the car runs off the track ropes on to fixed rails so curved as to reverse the car by dropping the forward end and turn it back toward the loading terminal, upside down. As the forward end drops, the material slides out of the car into the bin, and from this bin direct to railroad cars by means of the two chutes shown in the accompanying illustration.

Power is applied at the loading terminal from a marine type steam engine through belt and spur gear drive to a clutch wheel on which are mounted toggle clutches that grip the haul rope.

To haul coal from the railroad siding to the mine, the direction of the tramway is reversed by throwing the reversing lever on the steam engine. Coal is delivered from the railroad cars into a track hopper, taken from there by bucket elevator and then delivered to a small bin directly above the terminal wheel. From this bin it is loaded into the tram cars by an automatic loader in the same manner as outlined in the operation at the loading mine. The bucket elevator is driven by sprockets and chain from the tramway terminal shaft, which in turn gets its power from the traction rope of the tramway. When the bucket elevator is not needed, the chain is slipped off of the lower sprocket as shown.

Flow of material into the loading hopper, either at the loading or discharge terminal, is controlled by the operator by means of a gate operated by a hand lever. This labor is all that is required to operate the line.

The operating cost, including labor, power, oils and grease, for such a line will not exceed $10 per day, and in some cases might be considerably less. At $10 per day, the cost per ton of ore would

Discharge terminal for ore at railroad siding and loading terminal for coal

be 5 cents per ton for a daily output of 200 tons.

An increase in capacity could readily be had by adding cars without materially increasing the operating cost, and the cost per ton reduced proportionately.

The tramway and loading and discharging terminal are designed and manufactured by the Interstate Equipment Corporation, 25 Church street, New York City, under the trade name of the "Lawson Automatic Tramway."

Missouri's Barytes Production

The American Barytes Corporation, Eldon, Missouri, Are the Largest Producers of Barytes in the World—Barytes Defined

By Catha Wells
Chillicothe, Mo.

A LITTLE over a year ago the attention of a group of business men was called to the rich deposits of barytes in the state of Missouri. The outcome of their investigations was the organization of the American Barytes Corporation, with C. T. Fogle as manager.

This company erected a mill at Eldon, in the heart of the state's barytes deposits, and that mill today is the largest producer of barytes in the world.

The mill has a capacity of 50 tons a day. As a large part of the production is done by machinery there is need for only about 25 men at the mill. Much of the barytes industry is carried on outside of Eldon by farmers living in the "tiff" belt, who bring in the rock during the slack times, although there are tiff diggers who have no other means of livelihood.

This product is chiefly obtained at an average depth of from 4 to 5 ft. and pits of more than 10 or 12 ft. are unusual, although a few pits are as deep as 20 ft. With the present methods of mining barytes these depths are prohibitive if a profit is looked for.

After the barytes is removed from the mine it is allowed to dry in the sun for a few days. It is then put into a small rattler, a box with a perforated bottom, rocked until the adhering clay is knocked off, and then piled until a convenient time can be found to haul it to the mill or to the railroad to be shipped to Eldon. It is not unusual to see great piles of barytes at a general store where it has been exchanged for other commodities. Once at the factory, the rock is sorted according to size and fed into a crusher. Afterward it is washed to remove all traces of clay and then ground in tube mills and bolted through a 300-mesh silk screen.

Some idea of the fineness of the finished product may be obtained when one learns that the finest grade of flour is bolted through a 150-mesh screen, having 22,500 holes to the square inch; a 300-mesh has 90,000 holes to the square inch, so closely meshed that it will hold water. While the bolted barytes is too fine to detect the least grit by taste, each particle is a distinct atom under the microscope.

The bolted powder is put through a settling tank to remove the excess water, then into lead-lined tanks where it is bleached by sulphuric acid at a temperature of 212 deg. F. Again it is washed to remove the acid, put into the rotary steam dryer, and sent to the packer. The finished product is shipped from the factory in barrels and sacks.

The barytes industry is not new to Missouri, for there are records of barytes being mined as early as 1819. There was a tiff mill in operation on the Osage river in 1866. In 1882 the United States produced 8,000 tons. The big spurt came in 1915, when in one year there was an increase in production of 100 per cent.

As a producer of barytes the United States leads the world, with Missouri leading all the other states. Barytes, frequently called "heavy earth" or "tiff," but known scientifically as barytes, baryta and barium sulphate, in one form or another enters into a great many products of manufacture. It is a mineral of high specific gravity, varying in color from white to yellowish gray. When ground into powder finer than flour its use becomes almost limitless.

Barytes is tasteless, odorless, nonpoisonous and in every way inert. Because of these negatives it lent itself to illegitimate uses at one time, but rigid pure-food laws put a stop to them and then it was that barytes, through scientific experiments and chemical processes, entered into its own as a valuable constituent of numerous articles in everyday use.

From an adulterant of cheap, inferior paint which did not hold its color, today it is chemically treated and combined with zinc-sulphate and lead, making the best grade of paint on the market. This paint is not only finer and whiter than others, but it has better oil suspension and is without deterioration in color.

Because barytes is practically insoluble in water and can stand great heat—its melting point is about that of cast-iron—it enters largely into the rubber trades; it is used as a filler for linoleum, oilcloth; it is in putty; in cloth around hams to keep out the air and insects; in pigments, printer's ink, aniline dyes, pottery, porcelain; as a coating to prevent aeration of certain cheese; in enameling iron and tanning leather; in manufacturing hydrogen peroxide; in asbestos cement, sealing wax, pyrotechnics; in finishing wall paper, manufacturing glass — especially plate glass, in which it increases the specific gravity, tenacity and elasticity.

Barytes enters into the high-grade ink used by the United States government in printing bonds, paper money, notes, stamps, etc. It is present in the heavier paper required for magazines; is an ingredient in some medicines, and is employed in chemical laboratories for precipitating metallic oxides.

Previous to the world war, Germany held first place in the barytes industry, but that country has been outstripped by the United States, and today Missouri furnishes more than 60 per cent of the barytes produced in the world. In importance of production, the states rank as follows: Missouri, Tennessee, Georgia, North Carolina, Virginia, South Carolina, Alabama and Kentucky.

Gypsum for Mortar

ALTHOUGH in ancient times gypsum was utilized for mortar in large buildings like the pyramids of Egypt, many castles and churches, it has been abandoned for this purpose in modern times. Now, however, new interest appears to have been given to the subject by the results of recent experiment.

When gypsum is heated at from 170 to 500 deg. C. an anhydrous sulphate of lime is obtained designated by the name soluble anhydride. This anhydrous sulphate is very little used, practically because it does not harden well.

Nevertheless when gypsum is heated to a temperature of from 500 to 1000 deg. C. a hard-setting plaster is produced SO_3 being thus eliminated. According to Gary the crushing resistance of pure plaster is about 100 kg. per sq. c. in 14 days, and according to Cramer 150 to 180 after 16 days and 170 to 200 in 30 days. Now this resistance can be greatly increased by adding a little sand. These experiments lead to the conclusion that prepared in this way gypsum might be employed for ordinary mortar containing from 1 to 3 per cent of portland cement.—*Rev. Mat. Constr.*

Crushing, Storing and Pulverizing*

A Discussion on the Preparation of Phosphate Rock

By L. H. Sturtevant
Vice-President and General Manager, Sturtevant Mill Co., Boston, Mass.

DURING THE LAST decade, crushing and pulverizing machinery has become highly specialized, and no longer is the "all-purpose" machine recognized in the modern plant. It has been found that machinery embodying certain principles is necessary to produce certain results, and by deviating from these principles inefficiency and a high-cost product, if not failure, is sure.

It therefore has been necessary for the machinery manufacturer to design many types of machines to accomplish economically the results desired in diversified fields. The experienced purchaser is not satisfied with simply buying an efficient pulverizer, for he realizes that such a machine constitutes only a small part of his plant. To produce cheaply he must arrange to receive, crush, pulverize, elevate, separate (if his material requires sizing) and provide storage for both raw and ground material. He must have power, shipping facilities and a suitable building to cover the esuipment, before his plant is complete.

It requires a man of wide practical as well as technical knowledge to design a plant and select the machinery and equipment best suited for any particular requirement. He must carefully consider the plant site in relation to the quarry or other source of supply of raw material; if at the quarry, the advantages of a side-hill location, where gravity can be utilized; if raw material is received by boat or cars, the best method of unloading. He must consider the size rock to be handled, and if large, whether it will pay to install a crusher having a receiving opening of sufficient size to crush any size piece that can be economically handled, or whether it will be better to sledge and use a smaller preliminary crusher, thus saving initial expense; whether or not the rock should be crushed before or after it is stored.

The method of storage and ability to reclaim material from storage with one handling and without excess labor is important, as is also:

The most efficient pulverizer for his particular material and requirements.

Whether or not the pulverizer requires a separating device; and if so, will screens or air be more suitable and the best kind to use?

How and where shall the finished product be stored?

If dust collecting is necessary or advisable?

The best shipping facilities.

It is easily seen that no one article of reasonable length could cover all materials and the machines suitable for their reduction; therefore only phosphate rock will be considered in this paper.

Phosphate Rock

Phosphate rock is mostly ground for the purpose of making acid phosphate, which is the principal ingredient in fertilizer, and, being used in large quantities, is handled mechanically to reduce labor costs, and its storage concentrated to economize space.

Unloading Power Shovel

Any grade phosphate rock, with the exception of the very large pieces of Tennessee blue, is economically unloaded from box cars by means of a power shovel. By this method one man can unload a car in less than one hour. If hopper-bottom cars are used, a slight change in the unloading arrangement can be effected to serve equally well.

When rock is received in boats, grab buckets and electric overhead cars are employed to advantage for its removal.

When rock is taken from the car or boat it must be stored (also crushed, if lump rock is used). Rock storage is therefore arranged to allow for economy in crushing, if this is required, and for mechanically removing from storage and delivering to the grinding unit.

Crushing

A swing sledge mill, hoppered to receive the rock directly from the power shovel, is used for crushing lump rock. This mill is of the open-door accessible type, heavily lined, and carrying coarse grate bars which form the bottom and act as a rough sizing screen (to 1 inch).

Operated at one-half the usual speed, this machine is peculiarly well adapted to this preliminary work owing to its reliability, low head room, large capacity, free discharge, difficulty in clogging, even product, quick and easy accessibility, low power and small upkeep.

The mill discharges into an elevator of equal capacity to that of the power shovel and mill.

The unloading arrangements embody provision for bypassing the mill, when rock requiring no crushing, such as florida pebble, is used.

Silo Storage

Several methods may be employed for storing the rock.

When possible, the silo type is preferred, because less ground area is occupied than when storing the same quantity on the ground floor of a building. Further, a belt conveyor placed in a tunnel under the silo easily reclaims the major portion of storage rock and requires little labor.

Rock piled on the ground, by means of an overhead conveyor or car, which inexpensively places it in storage, cannot be readily or cheaply reclaimed. If a conveyor of any kind is placed under such a pile, the ground area is so great that only a small percentage is automatically reclaimed, and the remainder requires hand labor for trimming.

Storing rock in piles around the building is expensive to place and to reclaim, as much labor is necessary for either operation.

The silo is the cheapest form of bin for its capacity, and can be duplicated when increased storage is needed.

Pulverizing

The grinding of phosphate rock is an important item in the manufacture of fertilizer, therefore has led to the development of many types of grinding mills more or less successfully used for this purpose.

The rock must be screened or separated after grinding, to produce the required fine, uniform dust, and this feature is equally important to that of grinding.

The necessarily insufficient screen area of internal screen mills does not permit of the free discharge of finished dust as fast as made. In consequence, much effort is wasted and action cushioned by the grinding members working upon material already of the proper fineness, which cannot escape. Therefore small capacity, large horsepower per ton of rock ground, excessive upkeep and clogging, due to damp rock blinding the meshes of the fine screens, have resulted in the practical elimination of such machines.

To overcome these objections other mills were developed, using large independent screens, entirely separate from the grinding mill. This system consists of a pulverizer, a circulating elevator and a screen. The rock passes through the mill, up the elevator and over the screen,

*A paper presented at the Seventh National Exposition of Chemical Industries, Eighth Coast Artillery, New York, September 12-17, 1921.

where the fines are removed, and the oversize is returned to the mill for further reduction.

The maintenance of screens, however, proved expensive, as frequent renewals of the screen cloth were necessary to prevent leakage. The moisture element was also objectionable, as the best of fine screens coat over and require constant brushing to maintain capacities.

Grinding mills have not been materially changed, but air separators have been developed to overcome screen troubles.

The ring and roll mill air separator grinding unit stands pre-eminent for producing uniformly fine phosphate rock at minimum expense.

The vertical ring and roll type of mill is extensively used wherever phosphate rock is ground. It is a slow speed, durable machine, of rugged construction, and cannot be equaled for dependability, accessibility, large capacity, small power and low upkeep.

It grinds by enormous pressures exerted by powerful spring-pressed rolls against a layer of rock fed to the inner surface of a revolving ring and held thereon by the centrifugal force generated by the ring's rotations. The material crushes and grinds upon itself and as there is no slip or rub to either ring or rolls, durability is assured.

These mills run smoothly, quietly and almost without vibration. They are built on the "open-door" principle for accessibility. Opening the door, the work of a few minutes, exposes the whole interior for inspection or replacement of ring or rolls, the mills' only wearing parts of importance, which last several years.

The drive is by single belt, or, if preferred, by motor, direct-connected to the mill, with a silent chain running in oil.

The product discharged from the mill falls into an all steel elevator of the chain and bucket type, designed for this installation.

These elevators are built with steel casings, well reinforced, and with large clean-out or inspection doors, conveniently located for quick accessibility, and, being self-contained, permit prompt, easy and cheap installation. Steel incased elevators, carefully made, prevent the escape of dust, are fireproof, more durable and much more satisfactory than those of wooden construction.

Built with split head casings, self-cleaning boots, geared heads, self-aligning ball and socket bearings, they are foolproof and power savers. Automatic spring tension take-ups act as a relief to prevent chain breakage, and automatically keep the chain taut.

Air Separators

From the elevator the ground rock is discharged into an air separator.

This machine has been developed to produce a fine, uniform grade of phosphate rock dust and to eliminate the usual difficulties inherent to screens.

The principle of air separation is the passing of a current of air through a thin, falling stream of material, at the required velocity to obtain the degree of fineness wanted and then to separate the dust from the air.

In this type of air separator centrifugal force is also employed to retard the coarser material, causing reaction against the air velocity and thereby insuring cleaner separation.

The material is fed onto a revolving plate which centrifugally distributes it in a thin stream, through which a strong air current is passed, removing all of the fine material, and thus a partial separation is accomplished.

This product is whirled spirally upward by the fan suction; the coarser particles, being more strongly acted upon by centrifugal force, are held within an inverted conical chamber, thus being prevented from following the fines, or dust, which pass upward and out with the air through a large slow speed fan, which carries them into a second cylindrical compartment. The dust is herein again rapidly whirled by the fan blast and the increased centrifugal force thus created is sufficient to cause the fine particles to cling to the exterior walls of this chamber, gradually working spirally downward by gravity.

A series of adjustable, tangentially arranged vanes surround the inner cylinder in the path of the return air current, and accelerate the already strong centrifugal effect, allowing the air to enter, but repelling the dust particles, which settle in a cone-shaped discharge hopper.

The same air is used indefinitely, the volume remains constant, and the desired fineness of product is obtained by regulating the fan speed and adjusting the openings between the vanes.

From 6 to 10 horsepower is all that is required to operate any size separator.

The separated dust, now of required fineness and deposited or settled in the discharge cone, is carried away to storage. The coarse, or rejected, particles, are returned to the mill for regrinding. The air current is of low velocity, consequently little power is used and the upkeep is small. The use of an air current for separating tends to dry the material, therefore rock of higher moisture content can be ground more economically than when screens are used.

Capacity

The capacities of such a plant will vary according to the grade of rock ground, its size and moisture content, but such units generally have outputs of from 3 to 16 tons per hour according to size of machinery used.

Phosphate rock should be ground to a sufficient fineness to allow the acid to penetrate quickly to the center of the particles and to eliminate the small black specks sometimes found, as they delay reaction; 90 per cent passing an 80-mesh sieve is amply fine for all requirements except that which is used for direct application to the soil, in which case 100-mesh is usually specified.

Dust Collecting

Preventing the escape of dust in a grinding plant has obvious advantages; saving of dust, which has a money value, cleanliness, better working conditions, elimination of bearing troubles and wear, reduction of moisture in rock being ground, due to the drying effect of air suction, etc.

A dust-collecting system is simple and comparatively inexpensive. By tapping and piping the heads of three elevators, connecting these pipes with a filter, and using an exhaust fan, a sufficient suction is created throughout the system to collect the fine dust, which would otherwise escape, and place it in the ground bin.

The steel plate fan, especially designed for this service, discharges horizontally, at either right or left, or vertically, at either top or bottom, as desired; the pulley can also be arranged for either right or left hand drive to suit conditions.

The dust passes into an automatic bag filter, wherein the air is cleaned, the dust being deposited on the bags, the air passing through the cloth texture of these bags and out by way of a duct through a fan which exhausts it into the atmosphere. Nothing passes through the fan but clean air.

At frequent and alternating intervals each section of bag filters is closed, the air current reversed, and the bags shaken to remove the adhering dust, which falls into the hopper below. These actions are accomplished simultaneously and automatically by a single, simple mechanism and require no labor. The accumulated dust is deposited by gravity in the rock dust bin. Only 3 horse-power is required to operate this unit.

Rate on Stone Unreasonable

AN AWARD of reparation has been recommended by Examiner H. J. Wagner in a tentative report on No. 12930, Carney Cement Co. vs. Director-General, as agent, and Chicago, St. Paul, Minneapolis & Omaha, on a finding that charges on stone, during Federal control, from complainant's quarry near Mankato, Minn., to complainant's plant at Mankato, were unreasonable to the extent that they exceeded $5 a car. The shipments, numbering 200, were moved under a charge of $13.80 per car, based on the applicable rate of $5 per car, plus 1 cent per 100 lbs., and a weight of 88,000 pounds, or 10 per cent above marked car capacity.

Removal of Clay from Sand and Rock

No. 1—Selective Mining—Sorting—Dusting Off

By Edmund Shaw
Allen Cone Co., El Paso, Texas

THE REMOVAL of clay is a part of the preparation for market of a number of substances, chief among which are building and other sands, phosphate rock, etc. As there is no one word which includes these, the word "sand" will generally be used to signify the substance from which the clay is to be washed.

"Clay" will also be given the broadest meaning—that is, any mineral substance which muddies water, is not of a crystalline nature, and which forms a plastic mass with the right amount of moisture. The clay which is found with these substances when they are mined is mixed with them in different ways, and since the method of deposition has an effect on the process of removal, it will also be considered briefly.

Origin of Clay in Deposits

Clay comes from the decomposition or "weathering" of rocks, a process in which the oxygen of the air and water, the heat of the sun and the cold of frosts, acids and mineral salts in solution play a part. A considerable part of the clay that has to be removed is formed from the very rock which it accompanies. This is especially true of certain metallic ores, to a lesser extent of phosphate rock and to a still less extent of sand and gravel.

Clay which has been formed at one place is carried by water and deposited in another. It is in this way that the layers or strata of clay are formed in sand and gravel and phosphate rock deposits. One may see exactly how this occurs by studying the formation of those artificial sand banks, the tailings dams, which are to be found near all the ore mills in the Western mining states where water is scarce.

The ore which has been crushed to the fineness of sand is accompanied by considerable clay, which is also a product of the crushing.

Section of phosphate rock deposit showing deep layer to be stripped above the lump rock, and strata of phosphate sands and clay to be mined by the selective method

Editors' Note

Edmund Shaw, the author of this series of articles, needs no introduction to ROCK PRODUCTS readers. He will be remembered as the author of "Sand Settling and Sand-Settling Devices." In this series Mr. Shaw will describe the various ways of removing clay from sand and rock, a subject of great importance to all rock products producers.

The two are carried out of the mill to the dam by a stream of water. When the dam is reached the stream loses its force and the sand falls, making a sand bar at the point where the stream enters the dam. The water and the clay go farther on and form a pool in some low place. Here the clay settles and forms a layer on the bottom of the pool. This may go on for some time until the layer of clay has a considerable thickness. Then the force of the stream breaks through the sand bar and deposits a lot of sand on top of this layer of clay, which by that time has settled so finely that the grains of sand do not penetrate it. The dam is built higher and higher, and the increasing pressure on the clay compacts it into a fine, leathery substance, that, in thin

sheets, can be rolled up as if it were a fabric.

A third method in which the clay is deposited is by the permeation of solutions through a granular mass, like a bank of sand. These solutions may contain an iron salt, or salt of other metals, which will be left on the surface of the grains when the water evaporates, and this surface film is considered as clay for the purposes of this article. Real clay, held in suspension, may also be carried into the spaces between grains of sand and left there by the evaporation or the receding of the water.

Selective Mining—Stripping

A great deal of clay and other obnoxious substances, such as organic matter, is done away with by selective mining, and the commonest form of selective mining is stripping. Stripping consists of removing a layer above the deposit which contains most of the clay along with loam and vegetable matter, which is very objectionable in some cases. The layer stripped is usually, but not always, much thinner than the deposit that is worked; it depends upon the value of the substance that is being mined. Thus, in the phosphate fields of Tennessee the writer has seen where it was necessary to do 12 ft. of stripping to recover a deposit of less than half that depth.

Experience sometimes shows that stripping is unnecessary. The writer recently visited a deposit where stripping had been practiced for years. Then the superintendent figured that the amount to be stripped was so small in comparison with the tonnage from the bank that the material could be washed out more cheaply than it could be stripped. So stripping was abandoned, and there has been no noticeable difference in the cleanliness of the product (concrete sand), while the cost of operation is considerably lowered.

Usually, the main problem in stripping is the disposal of the waste. On starting operations the waste has to be piled up or carried to a distance at considerable expense, but after operations are well-established it is customary to dispose of it in mined out areas. Sometimes it is found to have a value of its own, as in gravel pits near Chicago, where the strippings are sent to towns in sandy sections along the lake shore to make lawns, etc.

Mining Out Clay Layers

Selective mining may also be used in mining the deposit itself after the stripping is completed. The clay removed in this way is that which is found in layers. It is detached from the clay and thrown back into the mined out area.

Such a method calls for hand mining, as it is only in rare instances that the steam shovel or the dragline operator can do any selecting. This would confine the method to small operations, if it were not that machines can be used to do everything but the actual digging, thus keeping hand work down to the minimum.

A description of such a large scale method may interest the reader, even though it is a little outside the field of this writing. This method is employed at one of the large Tennessee phosphate mines. The machine employed was designed by the owners of the mine, who are well known as engineers and designers of excavating and unloading machines. They call it a "cantilever machine."

The pit in which the miners work is about 50 ft. wide and is carried as far as is desired. A track beside the pit holds the machine, which is moved along as the work progresses. A long cantilever arm is carried from the machine across the full width of the pit. On this arm a "dolly" runs, with a hoisting rig that can be used at any point along the arm.

The men work in a line under this cantilever arm, throwing the lumps of clay and any waste rock they may encounter behind them, and shoveling the phosphate rock into pans of a special design. As fast as the pans are filled they are hoisted and dumped into cars which are on a track beside the machine. Extra pans are placed so that the miners do not have to wait; the miners do not object to this, as they are paid so much per pan.

Sorting Out Clay Lumps

If selective mining may be too high in cost to be considered in some special case, sorting out the lumps of clay may be possible after the product is mined and is on its way to the plant. The writer noted a very good application of hand sorting at a large sand and gravel plant in Ohio. A steam shovel was used to mine the sand and a conveyor belt to take it to the washing plant. Eight men, four on either side of the belt, picked off the big lumps of clay from the belt and sent a fairly clean product to be washed. This appears to be quite an expensive way to dispose of the lumps, but a little calculation will show that it was not expensive, for the plant production was 2500 tons per day and the wages of eight men could not add 2 cents to the cost per ton.

This plant is very careful of the reputation of its product for cleanliness, and the engineer in charge said that hand-sorting the lumps was the only good way he had found to keep clay balls from forming and going into the gravel. As will be seen later on, these clay balls are the most difficult form of clay to get rid of in the washing process, and the hand sorting was certainly cheaper than passing all the gravel through a log-washer or similar device. It is always the hard, tough, compacted layer clay from which clay balls are formed.

A method which combines selective mining and sorting is sometimes used in small operations in the "brown rock" phosphate fields. It is used only where the lump rock is wanted, the phosphate sands being thrown back with the clay. It is hand mining, but before loading the product the miner handles it with a broad fork, something like a wide spading fork. The lumps of clay and the sand are shaken off so that they fall between the tines of the fork; then the lump rock is thrown into the wagon.

Advantages of Selective Mining

It is to be noted that selective mining and sorting do not remove all of the clay, and that the sand or rock has still to go to the washing plant for final cleansing. But wherever sorting and selective mining can be practiced without going to too much expense there is a gain in the efficiency and capacity of the washing plant. This is very apparent in the case of washing phosphate rock containing fine sands. The limit of capacity of the washer is the limit of the water employed to take up the clay without making so thick a pulp that the fine sand will not settle out. A plant will wash approximately five times as much "muck" with 10 per cent of clay as it will wash of "muck" containing 50 per cent of clay. Both selective mining and sorting, however, require labor, and labor of a sort that it is becoming difficult to find. Hand mining in an open pit is very hard work—hot work in summer when one has to stand the full heat of the sun, as the breeze is kept away by the sides of the pit, and it is very cold and uncomfortable work in winter, with water, slush and ice under foot. In cold weather the sorting out of lumps of wet clay from the passing belt is a chilly, uncomfortable job. Hence, the tendency at the present time is to do away with hand work altogether and to depend on more efficient work in the washing plant.

Dry Method of Clay Removal

So far only methods which do not require a plant, and which are more or less preliminary have been considered. We now come to plant methods, and before proceeding to study the regular process, which washes off the clay with water, we may give some attention to a method which is still experimental, although at least one good-sized plant has been erected to employ it. This method is briefly described as dusting off the clay from the surface of the grains.

No water is employed in this method. The first step is to dry the crude material thoroughly. The clay forms hard lumps and also a coating on the outside of the grains. But as this coating and the clay lumps are softer than the substance from which they are to be removed, attrition will break them up and turn them to dust. The dust may then be blown away, leaving the product clay free.

(To be continued)

New Jersey Trap Rock Quarry

Delaware River Quarry and Construction Company Opens New Plant at Lambertsville—Has Installed an Unusual Crushing System

A CRUSHING plant that is the very symbol of simplicity and yet one that careful design and good management have placed on a plane of high efficiency is the recently constructed trap-rock crushing plant owned by the Delaware River Quarry and Construction Co., of Lambertsville, N. J. The company also operates a trap-rock plant at Moore Station, N. J., and besides engaging in the general crushed-stone business, it conducts a general contracting business of considerable size.

Known as the Gilboa Trap Rock Quarry, this Lambertsville plant is located about 16 miles north of Trenton, on the Delaware river. It is served by the Pennsylvania railroad.

Quarry and Quarry Operation

The quarry, which lies adjacent to the plant, has a face that runs from nothing to 200 ft. in height, the present length of face being 600 ft. Blast-holing is done with a 6-in. well drill, and gelatine dynamite, with Cordeau-Bickford for detonation, completes the cycle. A recent blast at this quarry loosened 75,000 tons of material (explained in "Hints and Helps for Superintendents" department of ROCK PRODUCTS, October 8, 1921).

The broken rock is loaded by two steam shovels—a Bucyrus 70-ton with 2½-cu. yd. dipper, and a Bucyrus 40-ton with 1½-cu. yd. dipper—into 5-ton, 36-in. gage, side-dump cars, which are hauled to the initial crusher up a 4 per cent grade for a distance of 1000 ft. by steam locomotives. The company operates two 15-ton and two 20-ton locomotives; and one locomotive and four cars make up a train. Delays in moving cars are avoided by a continuous track, each train dumping its load into the initial crusher and then continuing around through the remaining portion of a complete circle and back to the steam shovels.

Trap rock quarry. Rock loaded with 70-ton steam shovel

R. M. Montgomery, vice-president

Crushing Plant

At this plant the crushing system is most unusual in that the reduction of the stone is accomplished by six jaw crushers, five being set in line with one another. This 36x48-in. initial jaw crusher is set high enough above the others to cause the material to flow by gravity to the secondary crushers. The crushers are of the Farrel jaw swinging type.

The initial crusher reduces the stone to 10 in. in size, which flows by gravity

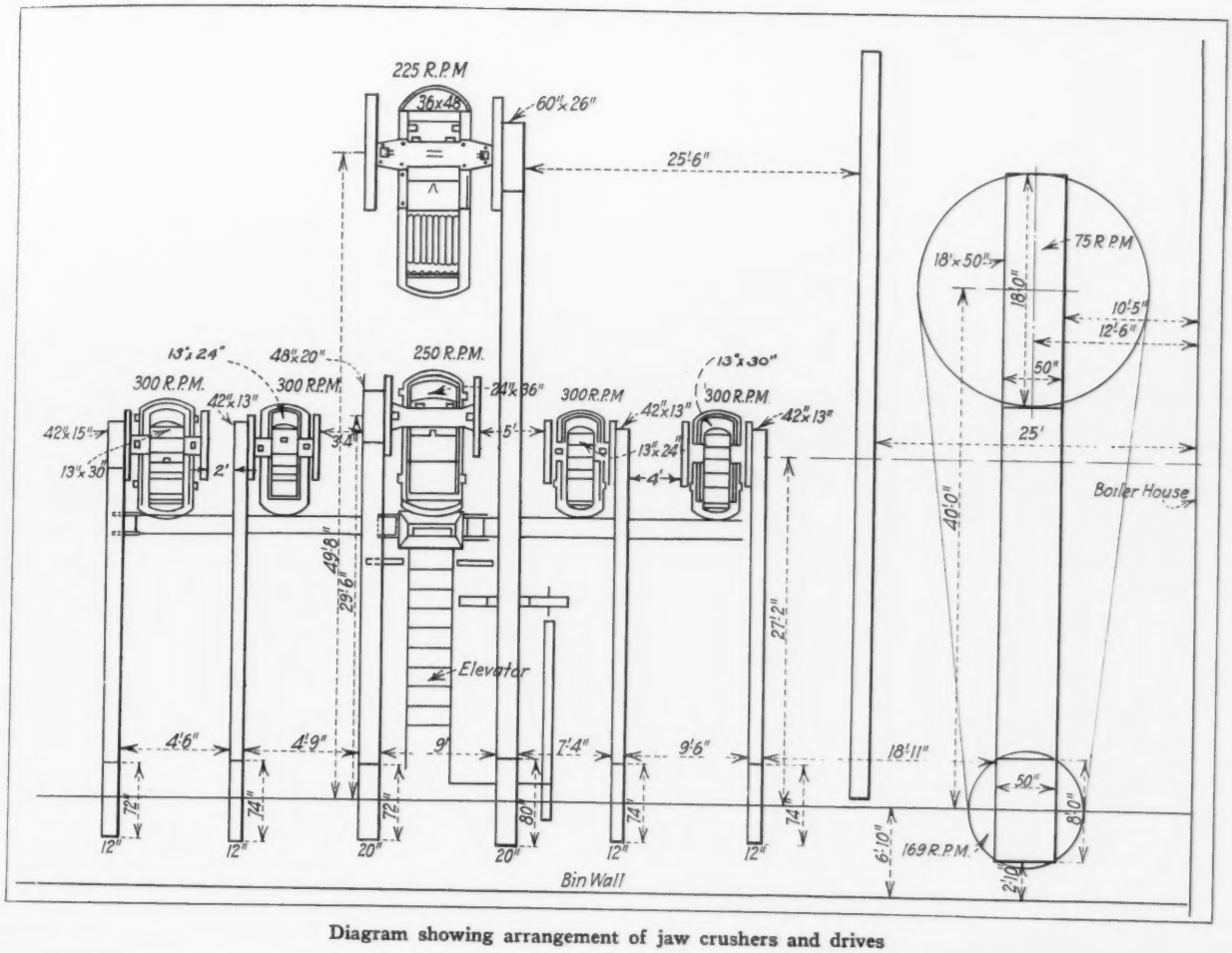
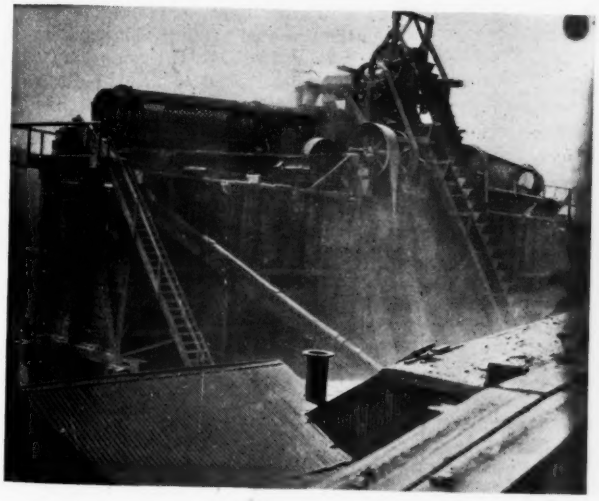


Diagram showing arrangement of jaw crushers and drives

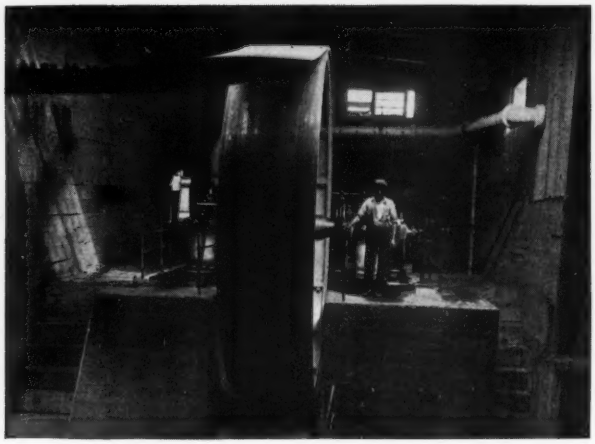


Bucket elevator delivering to screens. Note the method of drives

Side view of plant showing car-loading tracks

through a chute to the second jaw crusher 24x36 in. in size. The chute leading from the initial crusher is fan-shaped and also leads to the two 13x24-in. crushers, which are located on each side of the 24x36-in. crusher. This system of chute conveyage was explained in the "Hints and Helps for Superintendents" department, October 22, 1921, issue of ROCK PRODUCTS. Adjacent to each 13x14-in. crusher and in line with it is a 13x30-in. jaw crusher which provides for screening-plant rejections.

All of the output of the five secondary crushers is taken care of by one bucket elevator, which receives the material from a hopper set directly to receive the discharge of the 24x36-in. crusher. The discharge from the crushers on each side of



Corliss engine and belt-connected flywheel to main jackshaft

Arrangement of jaw crushers and drives

the 24x36-in. crusher is delivered to the bucket elevator hopper by two 20-in. belt conveyors of 40-ft. centers.

The bucket elevator is 70 ft. between centers, with a belt 43 in. wide and buckets 42 in. wide and 18 in. in the back and front constructed of ⅛-in. metal. It discharges into a V-shaped stone box on the top of the screening plant which chutes the stone to two screens, right and left. These manganese steel screens, furnished by the Taylor-Wharton Steel Co., Highbridge, N. J., are 5 ft. in diameter and 45 ft. long and are equipped with a dust jacket and sections of ¾, ⅜, 1½ and 2½-in. perforations. The sizes going through the screens are discharged to the bins below which have a combined capacity of 500 tons. The rejections from the screens are chuted back into the two 13x30-in. jaw crushers for further reduction. It will be noticed that this plant has no initial scalping screen, as most of the stone is sufficiently fine to pass through the screens. The bins are so arranged that the railroad cars may be loaded from underneath or at the side.

Side-dumping cars at initial crusher. Screens and bins at left

Power Plant

The power for the entire plant is derived from three boilers of 150 hp. and one of 175 hp., which furnish steam to a Watts-Campbell cross-compound condensing engine capable of developing around 1000 hp.

The steam engine is belt-connected to one jackshaft from which the entire machinery of the plant is run. The method of drives is shown in an accompanying diagram and, with the exception of one screen driven from the bucket elevator drive, everything is belt-connected to the jackshaft. The capacity of the plant is approximately 1400 tons of crushed stone per 10-hr. day.

Organization

The Delaware River Quarry and Construction Co. has its main office at Lambertsville. The company is entering its thirtieth year of operation. R. A. Montgomery is president; R. M. Montgomery, vice-president, and J. F. Schanley, Jr., secretary-treasurer. Louis Rooks is plant superintendent.

Bowling Green, Ky., to Have $5,000,000 Plant

IT is announced by D. C. Hale of Paducah, Ky., according to the *American Contractor* of January 28, that he with the aid of some Eastern and Middle Western capitalists, will develop 1000 acres of Kentucky rock asphalt and built a plant that will involve the expenditure of $5,000,000.

Mr. Hale stated that he and his associates have purchased 1000 acres of land on the Green river near Bowling Green, and that there is an almost inexhaustible supply of the crude asphalt on the holdings.

They have also purchased 16 acres of land in Delafield, which is just 16 miles from the proposed mine development. This land extends from the Green river to the Portage railroad, and is the site for the immense crushing plant and power house. This plant when completed will employ 800 men, according to Mr. Hale.

National Slag Association Elects Officers

AT the annual meeting of the directors of the National Slag Association, held January 28 at the offices of that organization in the Leader-News Building, Cleveland, Ohio, the following officers were elected for the coming year:

President, L. A. Beeghly, Standard Slag Co., Youngstown, Ohio; vice-president, C. E. Ireland, Birmingham Slag Co., Birmingham, Ala.; secretary-treasurer, H. J. Love, Cleveland, Ohio. The members of the executive committee for 1922 will be: L. A. Beeghly, Standard Slag Co., Youngstown, Ohio; E. H. Kuttner, Illinois Improvement & Construction Co., Chicago; C. L. McKenzie, Duquesne Slag Products Co., Pittsburgh; L. H. Hawblitz, France Slag Co., Toledo; H. N. Snyder, Buffalo Slag Co., Buffalo; J. M. Truby, Cleveland Builders Supply & Brick Co., Cleveland.

Output of Portland Cement in December

PRODUCTION of finished portland cement in the United States in December, 1921, was approximately 6,559,000 bbl. As compared with November, 8,921,000, this represents a decrease of 2,362,000. A seasonal decline was to be expected, and though the production in December, 1921, was less than in December, 1920, it was about 14 per cent more than the average for December from 1917 to 1921. The production in 1921, 98,293,000 bbl., was over 98 per cent of that in 1920, and was greater than that for any other year except 1920.

The shipments in December, following the usual trend, showed a decrease from those in November. The movement in December, 3,697,000 bbl., was over 9 per cent greater than that in December, 1920, but was slightly below the average for December during the last five years. The shipments made during the last half of 1921, 54,976,000 bbl., were approximately the same as those made during the last half of 1920. The total shipments in 1921, about 95,051,000 bbl., were nearly 99 per cent of those in 1920.

Stocks of about 11,938,000 bbl. of finished cement were in the hands of the manufacturers at the end of 1921, as compared with 8,941,046 bbl. at the end of 1920. This total exceeded the average stocks in hand at the end of the year from 1917 to 1921 by over 27 per cent. From April until October stocks of finished cement decreased steadily, but in November and December they increased. Stocks are usually accumulated during the colder months in anticipation of the large requirement in the months of active demand.

The statistics shown in the following table, prepared under the direction of G. F. Loughlin of the United States Geological Survey, are based mainly on reports of producers of portland cement, but in part on estimates.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that imports of hydraulic cement in December amounted to 25,327 bbl., valued at $57,064; the total for 1921 was 122,317 bbl., $388,828. The total imports in 1920 were 524,604 bbl., $1,254,729. The exports of hydraulic cement in December were 96,300 bbl., $282,074; the total imports in 1921 were 1,181,024 bbl., $4,277,135. The exports in December went to Cuba and the other West Indies, 48,781 bbl.; South America, 25,828 bbl.; Mexico, 11,203 bbl.; Central America, 6,238 bbl.; Philippine Islands, 3,205 bbl.; Canada, 266 bbl.; other countries, 779 bbl. The exports in 1920 amounted to 2,985,807 bbl., valued at $10,045,369.

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT IN 1921, BY MONTHS

Month	Production (barrels)	Shipments (barrels)	Stocks at end of month (barrels)
January	4,098,000	2,539,000	10,300,000
February	4,379,000	3,331,000	11,400,000
March	6,763,000	6,221,000	12,000,000
1st Quarter	15,240,000	12,091,000	
April	8,651,000	7,919,000	12,600,000
May	9,281,000	9,488,000	12,450,000
June	9,296,000	10,577,000	11,150,000
2nd Quarter	27,228,000	27,984,000	
July	9,568,000	10,301,000	10,414,000
August	10,244,000	12,340,000	8,280,000
September	10,027,000	11,329,000	6,953,000
3rd Quarter	29,839,000	33,970,000	
October	10,506,000	12,114,000	5,348,000
November	8,921,000	5,195,000	9,091,000
December	6,559,000	3,697,000	11,938,000
4th Quarter	25,986,000	21,006,000	
	98,293,000	95,051,000	

IMPORTS AND EXPORTS OF HYDRAULIC CEMENT IN 1921, BY MONTHS

(Compiled by Bureau of Foreign and Domestic Commerce.)

Month	Imports (barrels)	Exports (barrels)
January	14,678	225,561
February	18,269	84,230
March	7,631	97,302
April	1,540	93,009
May	2,035	82,409
June	1,657	100,831
July	3,455	81,091
August	10,988	84,538
September	5,177	84,668
October	11,448	79,871
November	20,112	71,214
December	25,327	96,300
	122,317	1,181,024

Preparation of Gypsum

GYPSUM preparation is now established as a profitable industry in Australia, but further enterprise to meet the big demand for this product is wanted, states the *Empire Mail*. In the manufacture of plaster and cement, artificial alabaster and paints, as a flux in metallurgy, a fertilizer of soils, and as filling for paper and textiles, and in numerous other arts and crafts, supplies of gypsum are required. Its use by the builder is on the increase.

Extensive deposits at Lake Macdonnell, in South Australia, and Tresco, in Victoria, are being worked at a high profit. There are deposits at the former place covering 30 square miles, and from 3 to 1½ ft. in thickness. The mineral occurs on the surface in the forms known as "flour," "seed" and "rock" or granular gypsum, and below it lies sufficient magnesium chloride to supply Australia and provide for a large export business in magnesium for years to come.

Illinois Starts Plans for State Cement Plant

ACCORDING to the daily press, Director C. R. Miller of the Illinois Department of Public Works has begun the execution of plans already perfected for the building of a state cement plant.

"We have just commenced to fight," said Mr. Miller. "We are going to build roads in Illinois, but we are not going to pay exorbitant prices to the cement trust. Governor Small is just as determined as ever to build 1000 miles of road this year, but he is not going to permit the cement trust to rob the farmers of Illinois with war-time prices when the price of their product is continually dropping. I have had expert engineers at work for some time on plans for a state plant. We have $5,000,000 for road material plants and we are going to build."

Magnesium in Dolomitic Lime and Limestone Has Agricultural Value

THE two so-called lime elements are calcium and magnesium. They are commonly associated in most liming materials, and both elements are capable of neutralizing free acid. Both are known to be essential plant nutrients. Since both are essential, it is naturally presumed that they perform different functions. The best present information as to that function is reviewed by R. W. Thatcher in his recent book, "The Chemistry of Plant Life":

Magnesium, like phosphorus, is finally stored up mostly in the seeds, not remaining in the leaves and stems, as do calcium and potassium. This fact, together with other evidence obtained from experiments in growing plants in culture solutions containing varying amounts of this element, has led certain investigators to the conclusion that the role of magnesium is to aid in the transport of phosphorus, particularly from older to more rapidly growing parts of the plant.

More recent investigations have shown, however, that magnesium has other roles which are probably more specific and more important than this one. It is now known that magnesium is a definite constituent of the chlorophyll molecule, serving as the means of linkage between its essential component organic groups. Because of this fact, magnesium-starvation produces etiolated plants, which cannot function normally.

This view is supported by the observations that when algae are grown in magnesium-free solutions they contain no fat globules and that oily seeds are richer in magnesium than are those which store up starch as their reserve foot material. Observers of the second of these phenomena have failed to note, however, that oily seeds are likewise richer in phosphorus than are starchy ones, and that the presence of larger proportions of magnesium in such seeds may, perhaps, be related to phosphorus-translocation rather than to fat-formation.—*Bulletin, National Lime Association.*

$35,000 for Lower Freight Rates

The New Orleans Convention of Sand and Gravel Producers Shows 1921 Progress—Secretary Sutton's Resignation Announced—Dann Is New President

A YEAR plotted well down in the trough, if not at the very bottom, of the business cycle curve, could not prevent sand and gravel producers from holding an optimistic convention in the Sunny South. The year 1921 did not treat all members of the National Association of Sand and Gravel Producers alike; a few saw little or no decrease in their usual profits; others had practically no business, and lost large amounts; almost every degree of profit and loss between these extremes has been well represented during the past year in this industry. All producers are agreed on one thing: high freight rates have caused a considerable reduction in the volume of their business and lower rates form one of the most important steps toward better business in the coming year. Lower freight rates are confidently hoped for, and the prospect of greater activity in both building and highway construction makes the outlook brighter for sand and gravel men than for men in most of the other industries of the country.

High freight rates have been the chief problem of the past year, and the efforts of the association have been directed largely toward a reduction of those rates. At the New Orleans convention, held February 1, 2, and 3, Treasurer John Prince reported how the $35,000 of 1921 income had been spent, largely in the cause of freight rate reductions; and Executive Secretary E. Guy Sutton, in his annual report presented at the convention, described the various steps taken and the progress made toward lower rates.

The treasurer's report showed an income during 1921, including back dues collected up to January 27, 1922, of approximately $39,000, of which something more than $35,000 was paid out for the current expenses of salaries, office rent, printing and stationery, traveling, convention, bulletin, and other items.

The membership list at the time of the convention included 182 paid-up members, with 65 more whose dues were in arrears in varying amounts. On a basis of dues paid in, the 1921 membership showed an increase of from 10 to 15 per cent over that of 1920. On the basis of the 1921 membership, and the reduced tonnage of last year on which 1922 dues are based, Treasurer Prince looks forward to a reduction of income this year of from 10 to 15 per cent, or an amount practically equal to last year's increase. The prospective drop in the association's revenue can be overcome by increasing the membership, and that is one of the aims of the association.

At the Head of the Sand and Gravel Industry for 1922

The following officers and members of the executive committee will direct the National Association of Sand and Gravel Producers for the coming year. The president and first two members of the executive committee named were elected at the New Orleans convention last week; the other four do not complete their two-year term until the end of this year.

PRESIDENT

Alex W. Dann, Keystone Sand and Supply Co., Pittsburgh, Pa.

VICE-PRESIDENT

George J. Nattkemper, Summit Sand and Gravel Co., Terre Haute, Ind.

EXECUTIVE SECRETARY

Not yet selected.

TREASURER

John Prince, Stewart Sand Co., Kansas City, Mo.

EXECUTIVE COMMITTEE

V. O. Johnston, Lincoln Sand and Gravel Co., Lincoln, Ill.

Hugh Haddow, Jr., Meantico Sand and Gravel Co., Millville, N. J.

A. P. Burke, Atlanta Sand and Supply Co., Atlanta, Ga.

C. L. Ruffin, Massaponas Sand and Gravel Co., Fredericksburg, Va.

The report of Secretary Sutton, which appears elsewhere in this issue, describes in detail the association's activities of the past year, particularly its emphasis on freight rate reductions.

While not extensive, the program of papers and discussions at the convention was well balanced. A paper on cost accounting presented a business subject in the interests of better administration; one on sand separation covered a technical side of production; and an address by Congressman Sanders, of Indiana, brought to the convention some of the workings of Congress, as well as a fresh viewpoint on the freight rates problem. Thomas H. MacDonald, chief of the Bureau of Public Roads, Department of Agriculture, was assigned the subject, "The Immediate Future of Highway Building," but illness prevented him from making the trip from Washington.

The discussion of cost accounting by George Kilian, secretary of the Dixie Portland Cement Co., appears elsewhere. Part of Congressman Sanders' address is also published, along with Secretary Sutton's report, giving two sides of the rate question.

The business sessions and discussions resulted in constructive action in two or three directions—cost accounting and freight rates notably.

Most important from the association's point of view was the announcement of the resignation of E. Guy Sutton, executive secretary of the association. The resignation was tendered in November, but public announcement of it had been withheld until the annual convention.

Mr. Sutton has for some time planned to return to production work with the Carmichael Gravel Co., of Williamsport, Ind., which he left in 1918 to become secretary of the Indiana Sand and Gravel Producers' Association. The loss of his services to the association will be seriously felt. Members of the association presented Mr. Sutton a handsome watch in appreciation of his able and conscientious service, and the association adopted resolutions acknowledging "its indebtedness for highly efficient representation before various public bodies, for valuable contracts made, for the promotion of harmony between its members, for tactful persistence in the face of serious obstacles, for wise counsels, and for increased recognition and respect to our industry."

No active steps have been taken to obtain a successor to Mr. Sutton; the new executive committee, at a meeting following its election, discussed the subject but took no action.

Three new officers and directors were elected. Alex W. Dann, formerly chairman of the freight rates committee, was elected president, and V. O. Johnston, the retiring president, and Hugh Haddow, Jr., were elected to the executive committee. The terms of office of Vice-President George J. Nattkemper, Treasurer John Prince, and Directors A. P. Burke and C. L. Ruffin do not expire for another year.

Uniform cost accounting for the indus-

The STEERING STAFF of the Sand and Gravel Industry

V. O. JOHNSTON
COMMITTEE

HUGH HADDOW, Jr.
COMMITTEE

G. J. NATTKEMPER
VICE PRESIDENT

A. W. DANN
PRESIDENT

JOHN PRINCE
TREASURER

A. P. BURKE
COMMITTEE

C. L. RUFFIN
COMMITTEE

try is likely to become a reality. Following Mr. Kilian's paper, a discussion of the subject resulted in a motion, passed unanimously, indorsing an investigation of the subject by the National Association, and the adoption of a uniform method of cost accounting for sand and gravel producers.

Resolutions Adopted

Constructive action along two lines may result from two resolutions introduced by W. Frank Bradley. The resolutions, which were adopted by the Association, explain themselves. The first suggests a regional method of freight making. It is as follows:

WHEREAS, There seems to be a question in the minds of thoughtful persons as to whether this Nation can contique the present methods of arriving at the proper transportation charges by means of all the State Commissions plus the Interstate Commerce Commission.

We believe the time is fast approaching when industries such as ours, whose existence depends so much on transportation charges, should join with other national organizations with similar interests and study the question of Group Freight Rate Making.

Could a body similar to the Regional Reserve Bank be able to serve better a regional method of freight rate making since the regional method of caring for credit needs seems to work so well, perhaps a regional rate group would be more serviceable than state groups of freight rates.

BE IT RESOLVED, That the secretary and executive committee be instructed to give this matter serious consideration.

The second of Mr. Bradley's resolutions, herewith presented, is aimed at the wide use by railroads of the phrase "restrictive and punitive legislation":

WHEREAS, Railroad officials and their supporters constantly refer in public addresses to restrictive and punitive legislation; and

WHEREAS, There are laws governing banks and insurance companies and all corporations. If there are laws that are restrictive and punitive beyond public need, they should be repealed.

THEREFORE BE IT RESOLVED, That the executive secretary of this association be, and is hereby, with the consent and approval of the executive committee, instructed to communicate with the secretary and other officials of the national chambers of commerce and request them to join with the officers of this and other similar associations and secure from the proper railway association officers a list of said restrictive and punitive laws, that they may be examined and an effort made for their repeal, if in the light of modern business methods they can be shown to be punitive and restrictive.

Two Accounts of the Freight Rates Question

Secretary Sutton's Report Shows the Producers' Side—Congressman Sanders Tells the Railroads' Position

EFFORTS of the National Association of Sand and Gravel Producers to improve the condition of producers during the past year were aimed principally at a reduction of freight rates. Other activities such as membership federal legislation, specification, cost accounting, liability insurance, and cooperation with government departments were not neglected; the annual report of Executive Secretary E. Guy Sutton, however, indicates that the emphasis last year was placed on the securing of lower freight rates.

Congressman Everett Sanders, of Indiana, who addressed the convention on February 3, presented some facts which showed some of the difficulties of the railroads under present conditions, and indicated some of the reasons why lower rates are so difficult to obtain. Parts of Congressman Sanders' address is published following the report of Secretary Sutton, which appears below:

The efforts of the National Association during the year 1921 were addressed mainly to the solution of what seems to be the most important problem confronting our industry at the present time, namely, the removal of the inordinate rate increases which have been placed against the movement of sand, gravel and stone. The harmful effect that the prevailing high freight rates are having upon our industry manifests itself primarily in the following ways: (1) by encouraging the use of inferior materials supplied from local or temporary pits and quarries; (2) by restricting the market territory, thus causing an over-development and migration of the industry through the esablishment of intermediate plants; (3) by causing loss of investments in plants designed for greater tonnage; (4) by reducing the output with a consequent increase in unit cost of production; (5) by disturbing competitive relationships, and (6) by discouraging the development and prosecution of construction work.

Our fight for a readjustment of rates, as you know, really began back in 1918 immediately following the issuance of General Order No. 28, promulgated as a war measure, and prescribing an increase of 20 cents a ton on our materials. You will remember that we were finally successful, during federal control of the railroads, in securing a reduction of 10 cents a ton on sand, gravel and stone when they were used for highway construction. This slight relief, however, was canceled when the carriers took back their properties in March, 1920. In June of that year the Interstate Commerce Commission issued its order in Ex Parte 74 authorizing a horizontal advance of from 25 to 40 per cent on all traffic, irrespective of its nature or ability to bear further increases.

Why Freight Rates Are a National Issue

It has been the policy of the National Association since its organization to look upon the question of freight rates as being fundamentally a local proposition. The present officers and members of the executive committee have been at all times in strict harmony with this view of the matter insofar as individual rates are concerned; but during the last few years changing conditions have complicated the situation in such a way as to force consideration of the subject from a national as well as a local point of view. The chief reasons that have made it necessary to look upon the problem as a national issue are these:

1. The principle involved in the so-called Shreveport Decision has been embodied in the Transportation act of 1920, thus giving the Interstate Commerce Commission direct legislative authority to remove apparent discriminations in rates as between intrastate and interstate traffic (Sec. 14, par. 2, page 39), "the decision or order of any state authority to the contrary notwithstanding." In exercising this prerogative the Commission naturally brings the state rates up to the level of the interstate rates and thus both state and interstate rates are under national control.

2. Under Section 15-a the Commission is enjoined to prescribe rates such that the carrier as a whole—not as individual railroads—shall earn a fair return upon the aggregate value of the railway properties, the rate of return to be uniform for all rate groups or territories. In applying this rule of rate making, the state commissions in many cases have been rendered powerless, and thus, whatever the intent, this feature of the law has made the regulation of rates largely a matter for national consideration.

3. The advances prescribed by General Order No. 28 in 1918, and the increases authorized by Ex Parte 74 in 1920, were made applicable throughout the entire country. In other words, these advances were not local but national in their scope.

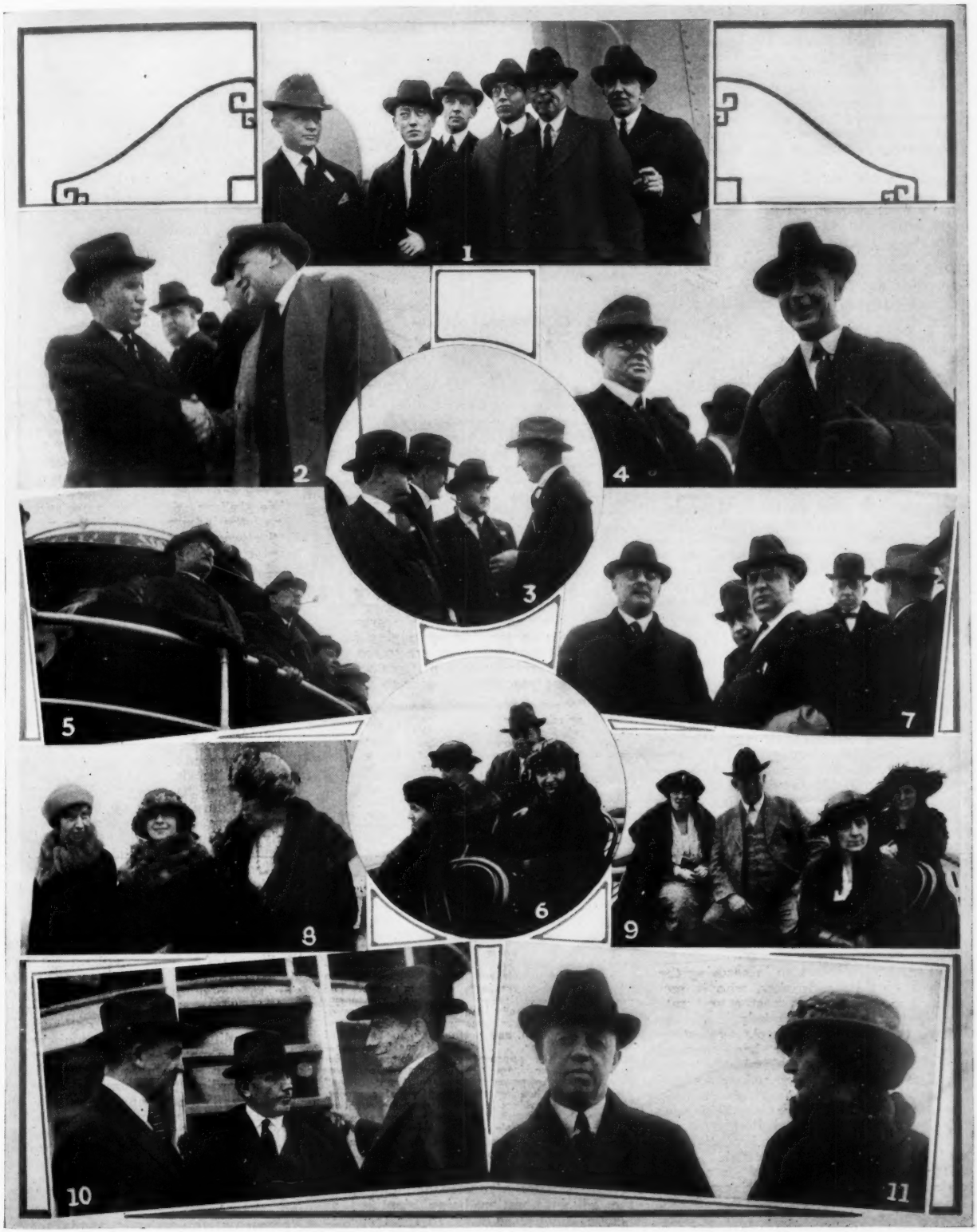
4. Previous to the war the railroad officials acted more or less independently in the establishment of rates, but now they are thoroughly organized; they look upon the subject in general as a national problem and act as a unit in opposing reductions.

At the very outset of the year 1921 it was realized by the executive committee that our industry could not be placed on a basis even approaching stability until substantial reductions in rates were effected and the uncertainty which existed with regard thereto was cleared away. Construction work in progress was being supplied with materials in many instances from temporary plants and wayside pits and quarries, while projected work was being postponed pending rate readjustments.

Under these circumstances and because of the insistent demand of producers from all parts of the country that action be taken to free the industry from its undue share of the transportation tax, the executive committee finally concluded to submit the question of what should be done to the decision of the membership. Accordingly, a conference of the members of the association was called at Chicago last May to give consideration to the matter. After the subject had been thoroughly discussed, a resolution was adopted by the conference recommending to the executive committee the course of procedure which should be followed to bring about the desired relief.

The Conference with Railway Traffic Officials

In accordance with the first recommendation, and after prolonged negotiations with Daniel Willard, chairman of the Advisory Committee of the Association of Railway Executives, arrangements were finally consummated for a conference between the higher traffic officials and the sand, gravel, and stone producers. This conference was held in Washington on June 2 and a representative number of producers from all parts of the country was present to assist in formulating and presenting the claims of our industry for rate reductions. It is unnecessary for me to recount here the excellent and comprehensive manner in which the case of the sand and gravel industry was submitted to the assembled railway executives by Alex W. Dann, of Pittsburgh, chairman of our freight rate committee. It was brought out that the increased freight charges had tended to divert shipments,



THE HARBOR INSPECTION TRIP—1. A serious-looking bunch—W. E. Rogers, W. E. Johnson, H. E. Shellberg, John Prince, F. W. Peck and F. A. Laughead. 2. Texas shakes hands with Minnesota—Robert J. Potts and J. L. Shiely. 3. It was a good story—J. E. Morgan, J. H. Hock, A. D. Greenfield and W. H. Collins. 4. Couldn't keep from smiling in New Orleans—J. M. Chandler and retiring President V. O. Johnston. 5. Looking for a whale—J. E. Carroll, Alex W. Dann, Walter F. Jahncke and George J. Nattkemper. 6 and 9. Wives weren't scarce—E. E. Crozat and E. T. Slider found them good company. 7. Look prosperous, don't they?—W. P. Carmichael and Sam C. Gates posed, while others peeked in. 8. More ladies—Mrs. John Prince, Mrs. H. E. Shellberg and Mrs. F. W. Peck. 10. Three gentlemen from Dixie—H. B. Springer, Walter F. Jahncke and George Kilian. 11. Farewell to Association work—Mr. and Mrs. E. Guy Sutton

which ordinarily moved by railroad, to motor truck and water transportation in spite of the fact that there was an abnormal surplus of railroad equipment standing idle, and that such diversion was making heavy inroads into revenue which was ordinarily derived by the railroads from the movement of our products.

When the conference was completed, the railway executives took the matter under advisement and shortly afterward announced that under existing conditions no reduction in freight rates could be justified or made effective. Nevertheless, soon after this conference with the railway executives, reductions were made in some sections of the country, especially in the Eastern territory; also, there was a marked difference in attitude exhibited by the carriers with respect to the reductions that were ordered by state commissions, in that fewer appeals from such decisions have been made to the Interstate Commerce Commission and to the courts.

Two Experts Aid in the Fight

Results secured from this conference were in no way satisfactory, since the measure of relief and the territory to which it applied were extremely limited. We therefore endeavored to arrange, as the second step, for an informal hearing of our case before the Interstate Commerce Commission; but after several unsatisfactory conferences with Commissioner Clark, then chairman of the Commission, we abandoned this method of procedure as a hopeless proposition. It was finally decided to file complaints with the Commission attacking the interstate level of rates. John S. Burchmore, of the firm of Borders, Walter, Burchmore and Collin, one of the leading firms of attorneys in the country, was employed to handle the legal phases of our complaints. Upon Mr. Burchmore's recommendation, our case was divided into four separate complaints, covering the Eastern, Central, Southern, and Western territories respectively, the latter including the Mountain-Pacific group.

In drawing these complaints it was recognized that the majority of sand, gravel, and stone moves on intrastate rates. One of the prime objects to be attained, therefore, will be to secure a lower level for interstate rates so as to leave the state commissions free to reduce intrastate rates without the charge of discrimination being lodged against them.

We were fortunate also in securing the services of Edwin Brooker, who is recognized as one of the most expert rate men in the country, especially insofar as knowledge of sand, gravel, and stone rates is concerned. He has compiled many valuable charts and tables to substantiate our claims for reductions and the exhibits which he has submitted in the state and interstate cases in which we have participated have elicited favorable comment from the railroad officials as well as the producers interested.

The hearings in the Central States complaint were completed on January 25. Briefs will be filed on February 9 and after oral argument the matter will be before the Commission for decision. It is believed that the Central States complaint will be in the nature of a test case. Nevertheless, we are prepared to prosecute the other complaints with dispatch in order that the whole rate situation may be adjusted as quickly as possible.

On January 24, President Johnston appeared for sand, gravel, and stone producers in the general investigation proceedings now being conducted by the Interstate Commerce Commission. Mr. Johnston made a very forceful appeal, which we believe will result in the Commission giving special attention to the needs of our industry in the way of rate reductions.

Aside from our direct efforts toward securing freight rate reductions, your secretary had a prominent though inconspicuous part in shaping the report of the Committee on Construction Industries of the Conference on Unemployment, which recommended a removal of the pyramided rate increases on building materials as one means of stimulating construction work.

Present Conditions of Freight Car Supply

During the year 1921 only a few complaints came to our headquarters of instances where railroads had refused to supply empties and in each case we lodged protests with the Car Service Division. Upon investigation it was found that the railroads had acted without authority in denying cars to producers and the situation was speedily remedied.

However, sand, gravel, and stone producers will not soon forget the experiences of 1920, when, as a result of priorities, our industry was so severely crippled. If all unfavorable aspects of our business were adjusted to our complete satisfaction and a fair supply of cars were withheld, the industry would become demoralized and soon cease to function altogether. We must, therefore, be prepared at all times to see that our rights for a fair distribution of cars are respected. The following is an excerpt from my report of last year dealing with this question:

> As a principal part of our plan to obtain permanent relief we have been working very closely with the Senate Committee on Reconstruction and Production headed by Senator Calder of New York. At the request of this committee we have prepared and submitted a proposed amendment to the Transportation act intended to eliminate the power of the Interstate Commerce Commission with respect to priorities and preferential car supply. Our suggestion in this regard was well received by the committee and we have reason to believe that it will be passed on to the Senate Committee on Interstate Commerce with favorable recommendations."

To demonstrate that our work in this respect was effective, I quote as follows from the final report of the Senate Committee referred to:

> It is commonly accepted by both shippers and carriers that priorities in practice invariably create situations which eventually are worse than those which they are intended to mitigate. The granting of priorities or preferential transportation service may easily lead to insidious and predatory practices, favoritism, special privileges, unjust discrimination, and profiteering in the sale of human necessities. . . . A bill has been introduced, with the approval of the committee, intended to take from the Interstate Commerce Commission the power to declare "emergencies" without a full hearing and the filing of a report. If Congress considers it wise to delegate such extreme authority, with its possible menace to the industry of the whole country, would it not be best to place it in the hands of the President?

On April 13, 1921, Senator Calder introduced in the Senate a bill which followed the lines of our recommendations, the bill in question being identified as Senate Bill 690. Owing to the fact that the Senate Committee on Interstate Commerce has been conducting a general investigation into the railroad situation, it was not found practicable to press this bill for consideration during 1921. However, I have submitted to the committee a brief reciting the reasons which actuate us in urging an amendment to the Transportation act restraining the Interstate Commerce Commission from arbitrarily, and without a moment's notice, issuing car service orders, which can have but one effect, that of disturbing all industry and destroying business in general. It is our purpose to press for early and favorable action on this bill in order that our industry may be relieved from the contingency of a sudden denial of transportation facilities.

While no definite action has as yet been had on the bill, its introduction has had a most salutary effect upon the attitude of the Commission and the railroads toward our industry. In this way, we have served notice that the sand, gravel, and stone industry, organized into an active association, is determined to see that it will not be treated unfairly in the issuance of governmental and official regulations. We assert that in the case of a common and national misfortune, we stand ready to abide by all reasonable and equitable orders; but we likewise maintain that in the event of a shortage of transportation equipment, all industries should share alike in the shortage and no one should be completely cut off from its right to move its products while other industries enjoy the right of way over the railroads.

We believe that the association has served the industry in no better way than in the progress which has been made toward curing the evil situation which existed with regard to car supply.

A Danger to be Carefully Watched

Before leaving the subject, it may be well to discuss briefly the possible situation with respect to car supply for next year.

As a result of exploitation, bad management, labor difficulties and inconsistencies, too much regulation and experimentation, for all of which the railway officials, the public, and the Government are in varying degrees responsible, the railroads today are in a bad condition. They have not kept up with the industrial development of the country. If the business of the country should suddenly or even gradually return to its so-called normal magnitude, the railroad facilities, including main-line tracks, terminals and rolling stock, would be wholly inadequate.

The railroad labor situation is not settled; the coal miners and the operators' agreements expire in April with every likelihood of a drawn-out contest being staged over the check-off system in addition to the question of wage reductions and the "open shop" and with the probability of a scant fuel supply on hand. The poor condition of railroad equipment in general is a matter of common knowledge and concern. The number of serviceable cars, according to last available reports, was only 85 per cent of the total cars owned by the railroads and the policy being followed by most of the carriers is to defer repairing their equipment as long as business is dull.

Elisha Lee, vice-president of the eastern region, Pennsylvania Railroad, in addressing the Association of Manufacturers' Representatives recently, made the following statement:

> The next time our country has a real revival of business, we shall in all probability be confronted with the most severe congestion of railroad traffic and the greatest inadequacy of railroad facilities ever experienced in our history.

I venture the assertion that if there were no other reason for maintaining a

strong national association, the matter of protecting our industry from an inequitable distribution of cars would fully justify its existence.

Other Association Activities of the Past Year

The impression must not be gained from the foregoing discussion of our transportation problems that the questions of freight rates and car supply have constituted our whole work; we have not been neglectful of other activities in which the association has engaged to the benefit of the industry at large, which may be summarized as follows: membership; finances; federal legislation; specifications; cost accounting; liability insurance; and co-operation with government departments.

How the Membership Has Broadened

It is perfectly plain that the National Association must represent a majority of the producers engaged in the business if it is to truly speak for the sand, gravel, and stone industry. Furthermore, it is only fair that every producer should bear his portion of the expense of the organization, since all share alike in the benefits. Besides, the money paid as dues by one member is rendered effective in direct ratio as it is supplemented by dues contributed by other firms. The executive committee, therefore, has deemed it a proper and necessary function of the association to conduct a campaign for increased membership, it being confidently felt that if the producers in all parts of the country are made cognizant of the assistance which the National Association renders to the industry, they will readily do their part in maintaining the organization.

The membership of the association until last year was made up primarily of producers in the Central States. During the year 1921 we have held meetings in various parts of the United States and have succeeded in enlisting the active support of many new members. We have covered practically all the outlying districts, including the far Western States.

We have secured the support of several large producers in the South and the officers of the association have felt keenly gratified by the manner in which the Southern producers have rallied to our support.

At most of the points visited, steps were taken to form state or district associations and the majority of them are now progressing rapidly to a point where they are the local safeguard of the industry.

How Federal Legislation Has Been Influenced

The location of our headquarters in Washington has enabled us to keep in constant touch with legislative developments having a direct or relative effect on the industry.

Our most potent activity along this line during the past year, aside from the proposed amendment to the Transportation act, has been in co-operation with the American Association of State Highway Officials, resulting in the passage of a satisfactory Federal Aid bill. The Bureau of Public Roads, under the direction of Thomas H. MacDonald, will continue, under the revised law, to have charge of the administration of Federal Aid funds, this arrangement being contrary to the original recommendations of the Senate Committee on Post Offices and Post Roads, which planned to create a Federal Highway Commission, with allotment of Federal Aid funds to interstate highways only. If this policy had been established, it is believed that it would have worked to the great detriment of our industry.

It should be mentioned that the officers of the association have at all times avoided the appearance of acting as lobbyists in an effort to secure or defeat pending legislation. All our negotiations with the members of Congress have been conducted without the air of secrecy and we have endeavored to communicate our problems in a frank, straightforward manner, relying on the soundness and merits of our contentions rather than by the exertion of any unseemly influence. We have succeeded in establishing cordial relationships with committees of Congress having to do with legislation and we feel sure that we shall at all times be afforded an opportunity to present without prejudice our side of the case on any pending legislation which may have a bearing on our industry.

Progress in Specifications, Cost Accounting, and Liability Insurance

Through the membership of your executive secretary on Committee C-9 and Committee D-4 of the American Society for Testing Materials and on Committee E-5 of the American Concrete Institute, it has been possible to protect the interests of sand and gravel producers in the formulation of typical specifications covering the use of our materials. It is obvious that it is highly important that we should maintain a close co-operation with these scientific agencies in order that the development of proper and economical specifications may be assured.

We have also co-operated with the Joint Committee of Engineers in the designing of standard specifications for concrete and it has been our privilege to be instrumental in contributing to the work of this committee by submitting some pertinent suggestions pertaining to the production and use of our materials.

At our solicitation, the Bureau of Public Roads conducted a series of tests to show the effect on the resultant concrete of different percentages of materials below ¼ in. in the gravel aggregate, when various proportions of cement are used. These tests were made at Purdue University under the direct supervision of Dr. W. K. Hatt. The conclusions reached have been used effectively in our efforts to get specifications drawn by the foregoing committees that will reflect economies in the production of our materials. The general publicity given to these gravel tests among engineers has been a great boon to the industry.

The matter of uniform cost accounting for our industry has been given consideration by a special committee of which Floyd Goodrich is chairman. The committee has made some preliminary investigations on the subject and expects to be ready to make a report carrying definite recommendations in the near future.

The question of liability insurance is a live issue with sand, gravel, and stone producers, for it appears that they are paying an unreasonable rate as compared with other operations of greater hazard. We have the matter up with the National Workmen's Compensation Service Bureau and are hopeful of getting a more favorable manual rating and classification established which is the basis for charges of all insurance companies whether old line, mutual, or reciprocal.

Co-operation with Government Departments

It would be impracticable in this report for me to go into detail with regard to our dealings with the various governmental departments and bureaus; suffice it to say that with the steady growth of governmental interest in business, it is both proper and essential that each industry have contact with these agencies.

Why Rates Are High

THE following extracts from the address of Congressman Sanders explain some of the causes of the present high freight rates:

After the railroads were taken over by the Government, Congress passed the Federal Control Act, which among other things gave to the President the power to initiate freight rates, and took away from the Interstate Commerce Commission the power to suspend the taking effect of the rates during the pending of a hearing.

When the rate-making power was delegated to the Director General of Railroads, and the necessity was presented for an increase in railroad revenues, the Director General issued General Order 28. In some cases there was a percentage increase of a little over 25 per cent and in other cases a flat increase of so much per ton, which reached as high as 200 per cent.

The difficulties were not ended when Federal control ended. At the time of the return to private operation, notwithstanding the high advance in freight rates, the roads of the country were operating at a deficit. A six months' guaranty period was given, at the end of which the new schedule of freight rates was to go into operation. In the meantime, the Railroad Labor Board had added some $600,000,000 to the labor bill, making a necessity for still higher freight rates and Ex Parte 74 was the result. The new schedule affected many industries, but the sand and gravel industry, being so sensitive to freight changes, was hit very hard. In many cases auto trucks were used in place of freight cars.

What is the best course to pursue to remedy the evil? Should there be a change in legislation affecting the roads? There have been three propositions urged: First, it is contended that the provision of the Commerce Act granting the right to the Commission to use priority orders unjustly discriminates against the sand and gravel industry. I think these provisions should be carefully studied with a view to securing such an amendment from the Congress as will protect the industry in its right to an equitable distribution of cars. This matter is not pressing now, but since large bodies move slowly, the association should not wait until the pinch comes to make preparation. I do not think that Congress will ever entirely eliminate priority orders in cases of emergency, but I feel that an effort with considerable hope of success could be made to hedge the priority provisions with such limitations as to make it accomplish only the purposes originally intended, that is, to meet the real emergency.

The second suggestion is to repeal the provision of the Transportation Act giving to the Interstate Commerce Commission supervisory power over freight rates within a state when it is found that they

are unjustly discriminatory or unduly preferential in view of the rate fixed on interstate commerce. Upon that question I assume that there will be differences of opinion amongst the several members. There may be some instances in which greater benefits will accrue to certain producers by giving to the State Commission exclusive power. Viewing the interests of the industry as a whole, I feel very sure that the law is more advantageous as it is now written. Suppose there is a plant within shipping distance of Chicago on the Illinois side, and one within a like shipping distance of Chicago on the Indiana side. The Interstate Commerce Commission has exclusive authority to fix the rate of the shipper from the plant in Indiana to Chicago, and the Illinois Commission has the power to fix the rates from the plant in Illinois to Chicago. If the Interstate Commerce Commission hasn't the power to prevent discrimination, the plant in Illinois may be able to secure from the State Commission a rate which will absolutely destroy the power of the Indiana plant to compete. This situation ought not to exist, and the remedy in the present law is adequate to secure immediate relief. While it might be to the advantage to the Illinois shipper, in the instance I have cited, if it were a question between an Illinois shipper whose products went into St. Louis, and a Missouri shipper whose products went to the same point, the reverse would be true.

The third suggestion is to repeal the rule of rate making in the Transportation Act. This ought not to be done. This was a rule which required the Interstate Commerce Commission to "establish rates so that the carriers as a whole (or as a whole in each of such rate groups or territories as the commission may from time to time designate) will under honest, efficient, and economical management and reasonable expenditures for maintenance of way, structures, and equipment earn an aggregate annual net railway operating income equal as nearly as may be to a fair return upon the aggregate value of the railway property of such carriers.

For a period ending March 1 next the act specified that a fair return was 5½ per cent (and under certain conditions 6 per cent) on the property value. This is some times erroneously referred to as a guaranty. It was not a guaranty, was never meant as such, and cannot possibly be construed as a guaranty. As a matter of fact, the roads earned less than 3 per cent on the value of their property as fixed by the Interstate Commerce Commission for the first year after the expiration of the six months guaranty period and are earning less than 3 per cent now according to the report of the Interstate Commerce Commission. The roads suffer the loss, however, and the Government has not agreed to and will not make up the difference, as would be the case if there were a guaranty.

Whatever may be said of the wisdom of these provisions, it can unquestionably be said that neither the guaranty for the six months nor the rule of rate making is responsible for high freight rates. The obvious proof of this is that the six months' guaranty was not added to freight rates, but was paid out of the treasury just like the deficit under Federal control, and the rule of rate making did not yield either 5½ or 6 per cent, but less than 3 per cent on the property value of the roads. This rate of return would have been commanded by the provision of the Federal and State constitutions against confiscation of private property.

There is just one thing that is mainly responsible for high freight rates and that is the high operating expenses of the roads. If the rates were reduced so that the roads would not receive any net return on investment, the reduction would not be a substantial one, and would give but little relief.

From September 1, 1920, to August 31, 1921, the year following the guaranty period, the total operating revenues of the class I railways, which represent 95 per cent of the revenues, was $6,045,338,100, and of that there was a net railway operating income of $530,655,927. This is but 2.9 per cent return on the property value of the railroads. The total operating expenses, including taxes, were $5,514,682,-173. It is clear that relief is not in providing less than the 2.9 per cent return which is represented by the 500 millions, but in attacking the operating expenses, which represent 5500 millions of the amount paid in rates. The latter is about 11 times greater than the former.

Having advised you to seek legislative remedy on the question of car distribution, and having undertaken to show that no legislative remedy can aid in reducing freight rates, I don't want you to think that I do not believe you can get the desired reduction in freight rates. I think the rates on sand and gravel are relatively higher than on other commodities. Your remedy, however, must not be in legislation, for under the present laws you have the right, first to a reasonable rate; second, to a rate which is not discriminatory, as between different commodities; and third, to see that your competitor's rate does not so discriminate against you as to keep you out of a market to which all are entitled. The remedy is administrative, and will be effected just to the extent to which you apply your energies in securing the administrative relief. The existence of this association forms the basis for the most effective work to be done in that respect. You must bring up all your forces to make war on high freight rates. Make out your cases clearly, overwhelm the tribunal with proof. Let all the members of the association give closest co-operation; furnish your Washington office with the proper data, so that the facts may be presented to the Commission.

Business is already on the mend. With the increase of business and the increase of revenues on the railroads, freight rates can come down. There is every reason for optimism in the sand and gravel industry for several years to come. I personally know there is contemplated appropriations of 50 or 100 millions of dollars annually to meet like appropriations from the States for the construction of highways alone in the next three years. While the high surtax, in which I do not believe, will retard business to a certain extent, your business is the one business which it will help. Municipal bonds and bonds of the States and State agencies for road and street building are free from Federal taxation, and a high surtax creates a ready market for such securities at a reasonable rate of interest. Looking the whole situation over from your viewpoint, it seems to me that there is every stimulus in the world for successful business.

Why Cost Accounting Pays

FOLLOWING are extracts from a paper presented to the convention by George Kilian, secretary of the Dixie Portland Cement Co.:

Cost accounting has for so long a time been considered an unnecessary and useless expense that when finally recognized for its real worth it has been abused and overdone. One large distributor in the South, awakening to the need of a perfect accounting system, employed a well known auditing concern from New York to devise and install a scheme. This was done without due regard to the local peculiarities of this specific business, and as a consequence the system was ever a misfit and was finally abolished. Cost accounting is not necessarily an expensive idea, as when properly applied it is made to fit the circumstances of any business, large or small. The fundamental costs, namely, wages and supplies, can be distributed by departments by the same foreman or timekeeper who now is employed, without penalizing the efficiency of the man in the least. A cost accounting system can be applied most advantageously to the smallest sand and gravel business and is of increasing importance with the larger investment.

If you do not know correctly the actual cost of your product, you are not safe in competition, and sooner or later will fill your alloted space in the industrial graveyard. You cannot now consider your business as one of self-interest, having no connection with industry as a whole, and so have no moral right to let your business run wild.

As an association, the gathering of actual cost figures or percentages is not permissible, but the building up of the fundamentals of a system applicable to this industry is not only sanctioned by departments of our Government but encouraged, this work to include consideration of the elements of cost entering into the process and the proper segregation of these elements. Following is an extract from an interchange of letters between the Fabricated Production Department of the Chamber of Commerce of the United States and the Federal Trade Commission:

> For a trade association to set up and induce the use by its members of a scientific and accurate plan of cost accounting is not only legal but highly beneficial to the individual members of the association. The use of this legal and highly beneficial information by each individual in establishing his own production cost and determining his own margin is entirely proper. If, thereafter, the association attempts to induce its members to disregard their own varying figures and use a common average or uniform figure of cost or margin or both, it has departed from its proper position of instructor and may easily take on the appearance of a price fixing combination in restraint of trade or in suppression of competition.

Upon the entrance of our country into the World War, the Federal Trade Commission was instructed to accumulate cost data for use of the War Industries Board in its treatment of essential industries. With one industry in particular, the Commission discovered that with half the reporting companies the items of depreciation and obsolescence were not included in their costs. The Commission considered the matter at length and then reduced these items to an average unit basis and included them as a part of costs when reporting to the War Board. The item of depreciation is of such importance that the industry referred to above was successful in securing the approval

of the Internal Revenue Commissioner to a mortality table compiled from a composite of the schedules in use at the time within this industry. The items of depreciation, depletion, and obsolescence have been overlooked so generally or considered merely expedients that their true importance is not yet fully understood. These three are just as surely items of cost as are your pay rolls, and that general manager who ignores them will some day be seeking a job.

Modern machinery, if kept in good repair, may continue to produce far beyond the average life given in the mortality table, but with the rapidity with which improved and more economical types are put upon the market, the item obsolescence should be given careful consideration. This item alone will extinguish your investment far more rapidly than competition.

How far does cost accounting pay?

If you know the real total cost of your product, you will seek a market giving your stockholders a fair return on their investment, at the same time preserving their capital account intact, and, competitive conditions preventing this, then your only recourse is to reduce your production costs, and this process must be pursued intelligently.

Your plants should be departmentalized —or divisions established to permit of monthly comparisons—as only in this manner can the "leaks" of the business be discovered. Your operating force is as keen to obtain results as you, but unless the office can localize the cause of increasing costs your superintendent must spend time necessary to locate the symptoms and detract from his efficiency as an operator.

The day when the back of an envelope was sufficiently large for your calculation of a year's earnings is past. There are so many contingencies entering into a business now that nothing but an accurate portrayal of your real costs is sufficient.

Few men will willingly sell their products below cost, but with a false knowledge of this factor little wonder that so many enterprises fail. Yours may be an unequal and an unfair fight; however, if your competitors are unenlightened as to their own cost of production, it then behooves you to preach this gospel regularly. You cannot do our country a better service than to raise industrial practices to a higher plane, and we honestly believe cost accounting to be one of the chief needs of the day.

Southern Producers Push Rates Case

Southern producers held a special meeting during the convention for the consideration of freight rates. The National Association plans to go ahead in each of the other four sections with the prosecution of the freight rates case without waiting for the decision in the Central States case, and the Southern producers upheld the program by selecting a committee to supplement the National Association's freight rate committee and to assist in preparing the case to go before the Interstate Commerce Commission. On this committee were selected from Kentucky, John M. Settle, of Louisville; from East Tennessee, H. B. Springer, of Chattanooga; from West Tennessee, W. L. Smith, of Memphis; from Mississippi, W. H. Rucker, of Itta Bena; from Alabama, W. H. Collins, of Spruce Pine; from Georgia, J. S. Waterman, of Atlanta; from Louisiana, J. E. Morgan, of Shreveport; from Florida, C. H. Harrell, of Flomaton. North Carolina and South Carolina will also be represented on the committee.

Social Features of the Convention

Social and entertainment features of the convention were limited on the program to a luncheon Thursday noon, to which wives of members were invited, and an inspection trip of the harbor Thursday afternoon arranged by the New Orleans Association of Commerce. These two official events, however, were only part of the entertainment enjoyed by most of the convention members, who found the old French section of the city, the French restaurants, and other interesting places full of novelty and romance.

On Saturday morning following the convention a party left New Orleans for Cuba. The party included Mr. and Mrs. Nattkemper, Mr. and Mrs. Biesanz, Mr. and Mrs. J. W. McGrath, and T. E. McGrath.

The Attendance

Joseph C. Aldous, Secretary and Treasurer, Mississippi Lime and Material Co., Alton, Ill.; David Alexander, Petersburg Sand and Gravel Corporation, Petersburg, Va.

Charles P. Biesanz, Biesanz Stone Co., Winona, Minn.; J. B. Blanton, J. B. Blanton Co., Frankfort, Ky.; W. Frank Bradley, Ohio-Michigan Sand and Gravel Co., Toledo, Ohio.

W. P. Carmichael, Carmichael Gravel Co., St. Louis, Mo., and Williamsport, Ind.; J. E. Carroll, J. E. Carroll Sand Co., Buffalo, N. Y.; J. M. Chandler, Price Sand Co., Tulsa, Okla.; W. H. Collins, Spruce Pine Sand and Gravel Co., Spruce Pine, Ala.; V. A. Cordes, Wolf River Sand Co., Memphis, Tenn.; Charles Corliss, New Martinsville Sand Co., Wheeling Sand and Gravel Co., New Martinsville, W. Va.; C. W. Crisler, Potts-Moore Gravel Co., Waco, Texas.

Alex. W. Dann, Keystone Sand & Supply Co., Pittsburgh, Pa.; C. S. Darling, "Rock Products," Chicago; Butler R. Davison, J. R. Davison & Bros., Pittsburgh, Pa.; Charles Donley, Ohio Valley Sand and Gravel Association, Pittsburgh, Pa.; Edward Donnelly, Ohio Gravel Ballast Co., Cincinnati, Ohio; J. H. Duffy, Ohio River Sand Co., Louisville, Ky.

Henry L. Ensminger, Macksville Gravel Co., Terre Haute, Ind.

R. C. Fletcher, Flint Crushed Gravel Co., Des Moines, Iowa.

Sam C. Gates, Kinzel-Thompson Sand and Gravel Co., Knoxville, Tenn.; A. D. Greenfield, Chehaw Sand and Gravel Mfg. Co., Atlanta, Ga.

B. Haislip, Traylor Engineering and Mfg. Co., Chicago; Hugh Haddow, Jr., Meantico Sand and Gravel Co., Millville, N. J.; F. E. Hall, F. J. Hall & Co., The Ohio River Sand and Gravel Co., Cincinnati, Ohio; H. H. Halliday, Halliday Sand Co., Cairo, Ill.; E. S. Hanson, "Pit and Quarry," Chicago; Ashleigh Harleston, Harleston Gravel Co., Greenwood, Miss.; J. A. E. Hoeveler, Iron City Sand Co., Pittsburgh, Pa.; Geo. J. Hoffman, Geo. J. Hoffman Co., South Bend, Ind.; Walter S. Holmes, Chickamauga Quarry and Construction Co., Chattanooga, Tenn.; C. H. Harrell, Escombia Sand and Gravel Co., Flomaton, Ala.; O. C. Hubbard, Wisconsin Mineral Aggregate Association, Milwaukee, Wis.; C. S. Huntington, Link-Belt Co., Chicago; R. G. Hengst, Universal Sand Co., New Castle, Pa.

Walter F. Jahncke, Jahncke Service, New Orleans, La.; V. O. Johnston, Lincoln Sand and Gravel Co., Lincoln, Ill.; W. E. Johnson, secretary Missouri Valley Association of Sand and Gravel Producers, Kansas City, Mo.

Geo. Kilian, secretary-treasurer, Dixie Sand and Gravel Co., Chattanooga, Tenn.

F. A. Laughead, Topeka Sand Co., Topeka, Kan.; C. W. Luce, Federal Sand and Gravel Co., Saginaw, Mich.

T. W. Maddux, Brookhaven Gravel Co., Brookhaven, Miss.; Milton McDermott, Knoxville Sand and Transportation Co., Knoxville, Tenn.; Joseph R. McGaw, Ohio River Sand Co., Pittsburgh, Pa.; J. W. McGrath, T. E. McGrath, McGrath Sand and Gravel Co., Lincoln, Ill.; Charles H. Miller, Allen Gravel Co., Memphis, Tenn., and Southern Sand Co., Little Rock, Ark.; J. E. Morgan, Victory Gravel Co., Inc., Shreveport, La.

George J. Nattkemper, Summit Sand and Gravel Co., Terre Haute, Ind.; E. H. Norblom, Landers-Morrison-Christenson Co., Minneapolis, Minn.

F. W. Peck, Muncie Sand Co., Kansas City, Mo.; P. M. Pfeil, Jr., Iron City Sand Co., Pittsburgh, Pa.; Robert J. Potts, Potts-Moore Gravel Co., Waco, Texas; John Prince, Stewart Sand Co., Kansas City, Mo.; M. W. Pugh, Mumesotu Pipe and Tile Co. and New Ulm Stone Co., Mankato, Minn.

Nathan C. Rockwood, "Rock Products," Chicago; W. E. Rogers, Arkansas River Sand Co., Tulsa, Okla.; W. H. Rucker, Itta Bena, Miss.

H. E. Schellberg, Lyman Richey Sand Co., Omaha, Neb.; John M. Settle, Ohio River Sand Co., Louisville, Ky.; Edmund Shaw, Allen Cone Co., El Paso, Texas; J. L. Shiely, J. L. Shiely Co., Inc., St. Paul, Minn.; E. T. Slider, Louisville, Ky.; W. L. Smith, Memphis Stone and Gravel Co., Memphis, Tenn.; R. Snoddy, Coon River Sand Co., Des Moines, Iowa; H. B. Springer, Dixie Sand and Gravel Co., Chattanooga, Tenn.; E. Guy Sutton, executive secretary, National Association of Sand and Gravel Producers, Washington, D. C.

F. C. Taylor, Missouri Portland Cement Co., St. Louis, Mo.; A. G. Thomas, Carondelet Building, New Orleans, La.; C. F. Thomas, Ohio River Sand Co., Pittsburgh, Pa.; M. E. Thompson, Cherokee Sand Co., Knoxville, Tenn.; A. P. Turley, Parkersburg Sand Co., Marietta Sand Co., Parkersburg, W. Va.

Charles R. Wilson, president Wilson Sand and Suppiy Co. and president Smiley Tow Boat Co., Huntington, W. Va.; J. R. Witty, Wabash Sand and Gravel Co., Terre Haute, Ind.

Ray C. Yeoman, Indiana Sand and Gravel Producers Association, Indianapolis, Ind.

Earl Zimmerman, The Ohio Gravel Ballast Co., Cincinnati, Ohio.

C. B. Andrews, Taylor-Wharton Iron and Steel Co., High Bridge, N. J.; Wm. H. N. Bennett, American Manganese Steel Co., Chicago; H. S. Grassman, Osgood Company, Marion, Ohio; J. H. Hock, Taylor-Wharton Iron and Steel Co., Chicago.

Rates Are Stifling Business, Says Hoover

IN his statement before the Interstate Commerce Commission during its recent general railroad investigation, Secretary of Commerce Hoover declared:

"I believe there are cases where earnings could be increased by lower rates. I know that it is contended that such opportunities do not exist, but no one can review the testimony given here during the past few weeks without concluding that the rates in special instances are stifling business. These directions are perhaps not important in the whole problem of rates, but I am convinced that lower rates would recover lost traffic, such as export coal, substitutions in building materials, gains in water competition, etc.

"If we look at the national economic situation as a whole, the greatest impulse that can be given to recovery from any source whatever is a reduction of rates on primary commodities combined with the immediate resumption of railway construction and equipment. The first depends upon reduction of operating costs, the second upon restoration of credit for our railways."

Annual Convention of the Sand-Lime Brick Association

Meeting at Dayton Shows Continued Growth and Improved Conditions in Industry —"Experience" Meetings of Producers a Feature

"HOW to produce a better sand-lime brick" has always been the keynote of the Sand-Lime Brick Association, and its annual meetings are always devoted to an interchange of information between producers on this very subject since its organization, some 20 years ago. At the eighteenth annual convention, held at Dayton, Ohio, February 1 and 2, not only was this subject discussed but "marketing" was also introduced since it is proving to be one of vital importance.

Members of the Sand-Lime Brick Association at Dayton, Ohio, in convention on February 1 and 2, 1922

As is usual with the Sand-Lime Brick Association this convention was one resplendent with cheer and good fellowship. Several new members were admitted. From the numerous papers read and from the tone of the general discussion and the favorable comments made, it is evident that the sand-lime brick industry is rapidly surging to the front.

President's Address

President John L. Jackson, made the opening address, in which he stated:

It is still early to prophesy what will happen in 1922, and one must be unduly courageous or particularly optimistic as to his own intuition. There are so many conflicting factors in the situation that while we might reasonably expect the new year to be a prosperous one, the man who studies the situation most thoroughly will in all probability be the least positive in his assertions. Irrespective of the many confusing and conflicting factors, both in the domestic and international situation, it is fairly safe to say that our industry can look forward with a fair degree of hope through the year 1922, and expect, if not a return to full prosperity, at least material improvement and betterment. It is well to remember, however, that many things prophesied in hope can only be realized by action, and that those who hope for things and do nothing to make them effective, are not really hopeful at all. During this year every person engaged in industry should have courage. We have preached against rash activity in times like these, and there is no reason to change our opinion. But there is a positive courage which advances steadily, not rashly, and takes advantage of the situations as they develop. We must go forward in 1922 with courage and hope and steadfastness. We must not assume that antagonistic factors will not eventually resolve themselves and be dispelled. We must not overlook the fact that much has been done and is being done to remedy serious fundamental conditions. The country has passed through a period of hysteria and is today on a more rational and common sense basis.

The architects in the United States claim that they have an average amount of work for all of their boards. That means a total of nearly six billion dollars' worth of new construction in the United States for this year—the lagest amount ever recorded at any one time. Study these conditions and see if you do not agree with me that there is an opportunity ahead to make up for the lean years just past. The good-will and favorable opinion of architects will have a deciding effect on the volume of business of our product in the fields or territories you are operating in and the entire United States, and it would seem prudent and wise to cultivate the architects, contractors and builders constructively and intensively. Architects, as you know, are ardent seekers after information about products of proven merit, but they are not given to trying experiments with unknown materials.

That there is a great housing scarcity throughout the country, is admitted, and because of the detrimental social and economic effect upon citizenship, public health and industrial stability, it becomes vitally important to the Nation and to its citizens that the conditions be relieved at the earliest possible moment.

The recent report of the United States Senate Committee on reconstruction, signed by Senators Calder, Edge and Kenyon, sup-

ported by testimony taken in many of our cities, should be convincing as to the need of some kind of action. High rates of interest, high cost of construction, difficulty in securing loans for homes, unwholesome crowding and public discontent are features of a condition that is widespread, and will be remedied by legislation.

Walter Stabler, comptroller of one of the largest of industrial insurance companies, whose investment in housing mortgages is very great, testified before the above committee: "We are facing a most serious situation in the housing field—the most serious that the country has ever seen; and it has not grown any better. It is growing worse."

A communication signed by many health commissioners called attention to the bad effect of overcrowding on the health of large communities, and Tenement House Commissioner Mann of New York City called attention to the housing of 99 families in a building built for 59 families.

Very recently, the Hon. Herbert Hoover, Secretary of Commerce, after an investigation of the housing situation, said, in an address at Chicago, that there was an indicated shortage of nearly 1,500,000 homes.

Would this not be an incentive for our association to start an advertisement campaign in order to induce prospective builders of homes to consider and use our products. This should be thoroughly and carefully considered by the association, especially at the round-table discussion. With the year's work done by our association in educating our members and manufacturers of our product, urging upon them the necessity of making a better product than our competitors at prices that will interest prospective builders, we have accomplished since our association was organized, I consider, wonderful results.

New Labor-Saving Equipment

It will be remembered that the 1921 convention of the association was held in Dayton in order to give the members a chance to see the new labor-saving equipment which was installed at the plant of the Crume Brick Co. At that time it was hardly possible to turn over the machinery, due to minor defects, and the convention was repeated in Dayton for 1922 to give the members a chance to see this installation in actual operation. One of the sessions of the convention was held at the Crume Brick Co. plant.

W. H. Crume read a very interesting paper on "Results Obtained with New Devices Installed at Crume Brick Co." In this paper he pointed out how difficulties and obstacles had been overcome and what were the relative results obtained between the old and new installations. Mr. Crume's paper is given elsewhere in this issue of Rock Products.

An inspection of the entire plant took place on the afternoon of February 1. The Crume Brick Co's installation is now operating very satisfactorily and may create radical changes in sand-lime brick manufacture.

Papers on operating costs were read by S. C. Kiser, Crume Brick Co., Dayton; I. G. Hoepfer, Acme Brick Co., Milwaukee,

and H. O. Joseph, Grande Brick Co., Grand Rapids, Mich. Mr. Joseph's paper was illustrated with a motion picture showing his plant in operation. The thing made evident in these papers was that continuous and automatic machinery was necessary if operating costs were to be reduced.

Advertising

The question of advertising in trade papers so as to familiarize architects and contractors with sand-lime brick was taken up by the convention. Many experiments were related where out-of-town architects had rejected sand-lime brick simply because they were not familiar with it. In such instances publicity would undoubtedly have been a great factor in determining the choice of brick, especially where a local proposition is concerned. The question was left to the executive board, which will cast a letter ballot among the members.

Lime Problem

Of late, the question of obtaining lime has become a serious problem with the sand-lime brick producers. Freight rates, car shortages, etc., have all been distressing influences and as a result some producers have set about to manufacture lime themselves.

C. L. North, Sheehan-North Co., El Paso, Texas, was unable to attend the convention, but sent in a paper on the "Improved Continuous Operation Pot Lime Kiln." Mr. North's company has used this kiln for some time and it has given unusually good results. The paper is presented in full elsewhere in Rock Products.

R. P. Brown, National Lime Association, Washington, D. C., read a paper on "Sand-Lime Brick and Sand-Lime Mortar." This paper will be published in an early issue.

H. W. Charlton, chemical engineer, Eastern Potash Corp., New York, was also unable to attend the convention but sent his paper on "Composite Brick" as made by his company. This paper will also be published in the near future.

Warren E. Emely, Bureau of Standards, Washington, D. C., read a paper on "Burning and Making Lime Suitable for Small Size Brick Plants." The paper dealt with a 50,000 brick per day plant, which would require 7½ tons of high calcium lime, or approximately 15 tons of limestone of a definite size, depending upon the size and type of kiln. Mr. Emely explained various uses of limestone and the various sizes and types of kilns. Rotary kilns would be entirely out of the question, but a shaft kiln 6 ft. in diameter and 30 ft. high would be adequate. A stone of approximately 3-in. size would have to be burned in this type kiln. A pot kiln of the same dimensions as the shaft kiln would have a greater fuel efficiency than the shaft kiln and could utilize smaller stone (½ to 3½ in.), but the resulting product would be of an inferior quality, as it contains ash and other impurities which would cause the brick to expand and break in the hardening cylinder. Mr. Emely pointed out that, un-

der ordinary circumstances, the brick manufacturer would find it cheaper to buy the lime than manufacture it, as too many variables such as adjusting output of lime to output of brick, closing during seasonal periods and breakdowns were involved, which would make lime manufacture uneconomical.

J. Morley Zander, Saginaw Brick Co., Saginaw, Mich., read a paper on "Handling Sand by Trucks." This paper dealt with the sand-handling methods of this company and will appear in an early issue.

E. C. Johnson, Marathon Mill and Machinery Co., Champaign, Ill., sent in a paper on the operation of the Marathon mill in the Crume Brick Co. installation. This was described in the May 21, 1921, issue of Rock Products.

Officers Elected for the Year 1922

In view of the fact that the officers had done such splendid work for the association during 1921, the entire personnel was re-elected unanimously. The officers are as follows: President, John L. Jackson, Jackson - Church Co., Saginaw, Mich.; vice - president, W. D. MacFarlane, Winnipeg Brick Co., Winnipeg, Manitoba; secretary, J. Morley Zander, Saginaw Brick Co., Saginaw, Mich.; treasurer, Allen G. Walton, Hummelstown Brownstone Co., Hummelstown, Pa. The executive committee consists of H. W. Terry, Toronto, Ont.; I. G. Toepfer, Milwaukee, Wis.; H. E. Knapp, Rochester, N. Y.; A. S. Bacon, Albany, Ga., and W. J. Carmichael, Willoughby, Ohio.

Results from New Devices Installed at Crume Brick Plant

Proper Design and Economical Operation Give This Plant Steady Production—Has Been Operating Since May, 1921

By W. H. Crume
Crume Brick Co., Dayton, Ohio

ON May 7, 1891, we were operating at capacity with one press, and during the balance of 1921 we made 4,496,700 brick, with the one unit. Dividing the production by the 34 weeks of operation shows that we maintained an average weekly production over that period of 132,200 brick, or slightly more than 24,000 per day, working 5½ days per week—that is, full time except the Saturday half holiday. I cite these figures to show the steadiness of our production and this in turn demonstrates that our installation is properly designed and gives us little or no trouble.

At the time of our last meeting our lime hydrating plant was balky, but was soon placed in smooth running condition by some slight changes in design and operation speeds so that it works as planned, with one man hydrating our lime at the rate of about 20 tons per day.

The chute from the proportioning and measuring machines (Poidometers) to the grinding and mixing machine (4x9-ft. Marathon Rod Mill) was redesigned and has not given us a minute's trouble since.

At the head of the inclined conveyor belt, we originally had a right and left hand cast-iron screw conveyor. This failed miserably as the material caked under the flights and stalled; this was corrected by replacing with a right and left belt conveyor.

We redesigned the feed head of the mixing and grinding mill, as we found the heavy rods had a tendency under certain sand conditions to crowd against the feed head and crack the liner plates.

The original discharge head of the Marathon mill was of the center discharge type, and while it was functioning we thought it could be improved, so we had a consultation with E. C. Johnson of the Marathon Mill Co., and he furnished us with the rim discharge head now in use. This rim discharge head clears the mill faster than the other type and consequently increases the capacity.

We had some trouble with the proportioning equipment, due to arching over of the lime hydrate in the steel hopper of the feed bin, and occasional trouble with the sand doing the same thing. The Schaffer Equipment Co. helped us to remedy this condition, and additional vibrators were put on each steel hopper. The wiring was then connected up to give absolutely automatic operation so long as there was raw material in the bunkers.

To prevent arching in the bunkers there was installed an automatic device for intermittently operating the vibrators, so that we now get an even flow of raw material, the intermittent vibrations preventing any tendency to arch. We have also designed and erected an incline for elevating the brick to eliminate pitching in stacking brick in the yard. We feel much pleased with the results accomplished by some of the changes and refinements made in our various devices.

As to the quality of the brick, I can truthfully say that we are proud of our product. Our brick are better than ever before, and our customers tell us so repeatedly. We hope to make them still better if possible.

As to economies resulting from perfected installation, they are many, direct and indirect. We have operated one unit of the plant this past year, with 13 men, against 19¼ men for one unit the year before—of course part of this saving is due to more efficient work per man. We can eliminate one man now in the crusher house with the change in contemplation and this will mean operating—including gathering all of the sand, hydrating the lime, steaming the brick and loading them out—with 12 men for 24,000 brick per day, two of these men being non-producers, a foreman and a repair man. The finer and more uniform grinding lessens the repair cost in keeping up the brick machines.

Our lime now goes further as none is wasted, and the mixture is more uniform. We could make good brick with less lime, but we prefer to make a better quality rather than save a little money at this point.

We have added four 3-hp. motors to the equipment, and four vibrator coils, but we operate with a few less horse-power than when operating one press and wet pan. A considerable saving in power will be made with the operation of both presses, as it takes very little more power to operate the Marathon Mill at capacity than it does for half capacity.

The average load of the Marathon Mill operating at half capacity is 41.5 hp. and running at full load the average is 51 hp. With both presses running full time, we estimate that it will require from seven to eight additional men or a maximum of of 20 men for 48,000 brick per day.

As to wear, we can only give you figures for the rods in the Marathon Mill. A check on the rods used by weight shows a loss of 914 lb. in making 1,672,500 brick—this being cold-rolled scrap bought at $42.50 per ton—giving a loss of approximately 8¾ oz. per thousand brick or a rod cost of less than 1¼c per thousand brick.

There is a metal loss also of the iron

lining and head, but we had no means of checking it. However, from frequent inspection this latter wear is undoubtedly less than on the rods, and with the mill at capacity the wear on the lining will be still less. My estimate on the entire metal loss per thousand brick would be that 2½ to 3 cents per thousand brick will cover it.

We have recently purchased another hardening cylinder and some cars and are getting our plant in shape to run double shift—to increase our production from 90,000 to 100,000 per day. We will be able to do this by operating the press crews and cylinder men during the night shift only, and by steaming for five hours at 120 lb., with ample allowance for raising and blowing off steam, with four cylinders we can operate day and night, holding the fifth cylinder for emergency or additional capacity.

We believe we will be able to manufacture just as good quality brick at night, as the measuring and mixing are automatic and the press operators and cylinder men will be in sight of the night foreman at all times.

Improved Continuous Operation Pot Lime Kiln

The Sheehan-North Company, El Paso, Texas, Operates a Cone-Shape Kiln and Is Getting Excellent Results

By C. L. North

Sheehan-North Co., El Paso, Texas

THE kiln operated by the Sheehan-North Co. of El Paso, Texas, differs from almost every other pot kiln in that it is cone-shaped inside; in fact, we do not know of any other kiln of like construction in operation. We have placed a sketch of this kiln before some of the best lime-kiln designing engineers for criticism, and they have not attempted to criticise it, chiefly for the reason that they have not had any experience with this type of kiln, but they all seem to think very favorably of it. Most of the engineers, however, seem to prefer a kiln constructed with dutch ovens on two or more sides, and not allowing the coal or fuel to come in contact with the limerock while burning.

As will be noted by referring to the drawing, there is shown under the screen a pile of ashes and fine lime that goes through the screen when the lime is drawn. This is generally considered waste and of little value in that it contains considerable ashes. I have found by experience, however, that I can hydrate this product and use it for the manufacture of our brick. It gives about as good results as though we were using our selected lump lime, the only difference being when a brick is broken open there can be seen some traces of the cinders from the lime kiln. But this does not seem to hurt the sale of the brick.

Now as to capacity. The size kiln shown in the drawing has a maximum capacity of 10 tons of lump lime and about 1 ton of ashes and fine lime per day of 24 hr. This kiln can be throttled down economically to a minimum capacity of 4 or 5 tons per day.

When running at maximum capacity, the ratio of fuel and rock is 1 part coal to 11 parts rock; in other words, there is a lime ratio of 1 lb. coal to 6 lb. of lime produced. This, of course, is considered a very low fuel ratio, and is based on using No. 7 anthracite coal. This coal is purchased from the Albuquerque & Cerrillos Coal Co., with mines located at Cerrillos, N. M., and costs us, laid down at the kiln, $9.48 a ton. Our limerock costs us, delivered to the kiln, $1.50 a ton.

One foreman operates this kiln, getting $200 a month, and the two Mexican helpers receive $2 each per day. They produce lime loaded either in the cars or the warehouse for $6.75 a ton. This figure is based on the operation of one kiln only. It can be readily understood that if we were operating more than one kiln, this figure could be somewhat reduced, as the high-priced man could look after several kilns.

The Italian we have in charge of this kiln has been in the lime-burning business all his life. It requires considerable experience before a man can burn lime without making core or having overburnt lime. He must be able to supply just the required amount of fuel to rock, which must be varied slightly from day to day, due to the temperature of the kiln. This temperature varies somewhat, according to the wind, as the draught is stronger at one time than another.

It should be understood that I am not a practical lime man. My experience comes from talking with our foreman, who is practical but not technical. I have studied all of the literature I could get hold of on the burning of lime and have come to the conclusion that all limerock is not burned alike, nor at the same temperatures, and while one grade of rock might work very satisfactorily in one kind of kiln it may not do so in another. Some limerock will burn at a very low temperature and others at a very high temperature. In some cases, the rock must be broken down to a very small size; again, it can be burned in very large pieces, such as our rock. The time required for the rock to pass through our kiln is approximately 50 to 60 hr.

Let me point out the advantages of the shape of the kiln we are using. You will note in the drawing that the part covered is the hot zone, or the upper half of the kiln, and that it is tapered out down to the vent holes. This is advantageous in that when the line is drawn below, the rock and fuel will settle away from the sides and not be so likely to stick. We never use a slicebar to break our limerock free from the walls, as is generally done in a straight wall kiln. By the time the rock and fuel have reached the draught holes, the fuel is practically exhausted and the lime begins to cool from the draught that comes up from the opening below where the lime is discharged. At this point it takes a reverse slope or concentrates the lime to be discharged through the opening below.

The lime in cooling throws off the heat through the hot zone above and is not wasted, as will usually happen when the hot lime is dumped from a kiln, as in a dutch oven type; and again, where there is a small opening in the top there is little chance for the heat to escape. One can almost stand on top of the rock in the kilns as so little heat escapes, except probably in the morning. It should be understood that we do not charge the kiln at night—no one takes care of it.

In the morning the kiln has settled down probably 5 or 6 ft. and the rock has practically turned to lime, being red hot. Then we start in to charge with a skip load of coal, leveling it off smoothly. Next, we charge with large-size stone of about 8-in. cube, say, two skip loads; then two skip loads of smaller rock about 5 to 6-in. cube, and then one skip load of finer rock, about 3 to 4-in. cube. This will fill

the kiln up level. Next, the man pulls the handbars at the bottom and lets down about 2 tons of lime—this will give an opening at the top—and then he goes around and puts in another charge, as has been described. By the time this operation is completed we will have removed the lime on the screen and picked it over or stored it in the warehouse. This operation requires about 2 hr. Another charge is then drawn, and so on, making between five and six draws a day. We very seldom get any rock in our lime. Some of the most expert lime men have seen our installation and they apparently think that it is a little wonder.

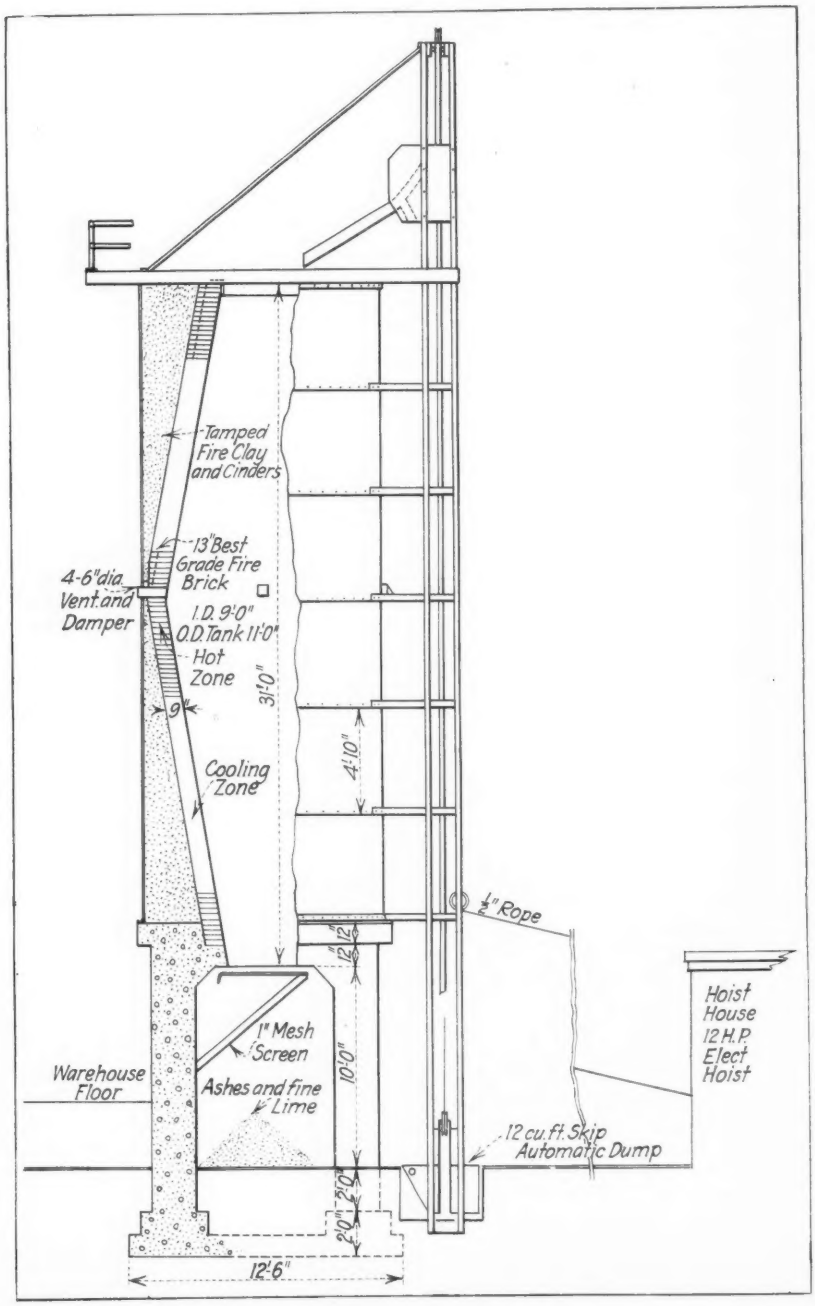
If other lime-kiln operators contemplate building this type of kiln, our company will be glad to furnish any information desired.

Would Force Cement Producer to Sell Direct

CONTRACTING interests in many localities are fighting angry, declares Horace H. Herr, editor of *American Contractor*, and there is a likelihood that an aggressive campaign to force certain material producers to sell in wholesale lots to contractors will be formulated when the National Association of Builders Exchanges meets in convention at Memphis on February 20.

"Retail dealers of building materials, notably cement," says Mr. Herr, "insist that material sold in their territory should be handled as local business, and therefore the retailer pays a margin on that business. In other years the contractor could buy direct from the producer in wholesale quantities and get the benefit of the wholesale price. Gradually this practice has been restricted until today it is almost impossible for the general contractor to buy direct even though the quantity goes into carload lots.

"Paying the retailer his margin increases the cost of construction and, in some instances, depending upon the local dealer means that the general contractor can not be sure of a continuous flow of materials to the job in quantities sufficient to prevent interruptions to the work. This again adds to the total cost of the completed structure."



Cross-sectional elevation of pot kiln

Slate Producers Organize

A conference meeting of the slate producers called under the auspices of the National Federation of Construction Industries was held in New York City at the Engineers Club on February 8. About 60 of the leading producers in the Maine, Vermont and Pennsylvania slate districts were present.

The program of the meeting included opening remarks by Chairman Oliver Bowles, Mineral Technologist, U. S. Bureau of Mines, and papers by Victor D. Abel, Structural Service Bureau, Philadelphia, Pa.; G. F. Loughlin, Geologist, U. S. Geological Survey; Phillips Wyman, formerly manager of the "Save the Surface Campaign," and J. A. Githens, Building Editor of the Philadelphia North American.

At the conclusion of the program a vote was taken on a resolution favoring the organization of a National Association of Slate Producers, and this resolution was unanimously carried. A committee was elected to prepare a plan for the organization of a national association, to suggest a name therefor, and to draw up a constitution and by-laws.

This committee comprises the following men and the class of slate represented by them: E. R. Norton, green and purple roofing slate; G. H. Shinvelle, milled Vermont slate; Richard Griffith, unfading milled slate; N. M. Male, milled Pennsylvania slate; W. H. Smith, Bangor roofing slate; Roscoe Berlin, slatington Pennsylvania slate; R. D. Chapman, hard vein Pennsylvania slate.

It has been planned to call another meeting within two months to act upon the report of the committee on organization.

I. C. C. Hears More Evidence by Sand and Gravel Producers

Elimination Asked of Ex Parte 74 Advances and of Half the 20 Cents Increase in General Order 28—Cement Industry Also Heard

THE case of the National Association of Sand and Gravel Producers against the Pennsylvania Railroad and other carriers, which was adjourned on January 18, was taken up on January 25. Here follows in abstract the testimony as reported by *Traffic World* of January 28:

As a result of two years' travel and study, during which he rode 80,000 miles, President V. O. Johnston advised the elimination of Ex Parte 74 advances and of half the 20 cents per ton increase made by General Order 28. Such reductions, he said, would be needed to restore to the railroads the sand, gravel and crushed rock traffic they hauled prior to the last two advances.

"In the early days," he said, "the railroads were anxious to observe the economic rule of not making the rates higher than the traffic would bear. Recently they appear to have adopted the slogan 'we need the money' and forgotten everything else. I am not unmindful of their difficulties, but it seems to me that if they had been as solicitious recently about what the freight would bear as they were formerly we would now be much nearer normal than we are. The result of these advances has been to restrict the radii of distribution. The wayside pits and trucks in the sand and gravel business are flourishing. They are a thorn in the flesh of the businesslike producer. It is our conviction that the country is on the way back to the condition which prevailed when each community had its local supply of unprepared material, and we, the producers and the railroads, are in a fair way to lose the money that we spent in building up this business. Run-of-pit gravel is being used instead of the washed and carefully graded gravel which the railroads used to haul."

"What percentage of reduction would restore the traffic to the railroads?" asked Commissioner Esch.

"We do not pay the freight. We are not interested in it until it becomes so high as to stop the movement. Loss of part of the business often forces unit costs so high as to close plants. We think the removal of Ex Parte 74 increases and the elimination of half the general order No. 28 increase of 20 cents would bring about the restoration of this business to the railroads."

Commissioner Lewis suggested that that would be a reduction of about 30 cents a ton. The witness was unable, he said, in answer to questions by Commissioner Aitchison, to say whether 1921 was the most prosperous year the sand and gravel men had ever known, or one of the worst. He said that it was the best year the sand and gravel producers in Wisconsin had ever known, but he ascribed that condition to the fact that, even where hauling was done by trucks, it was from the pits of men who had formerly shipped by railroad. He said that Illinois had saved the *sand and gravel men by the building of many hard roads.*

"Good roads appropriations were our life savers last year in Illinois," said the witness.

A more modest request respecting rates on sand and gravel was made by J. K. Moore of Oklahoma City, the rate expert of the Oklahoma Corporation Commission. All he asked was the elimination of Ex Parte 74 increases. He estimated that freight rates constitute from 20 to 60 per cent of the delivered price of sand and gravel. The Oklahoma commission, he said, had stimulated road construction by reducing the intrastate rates. That commission checked construction by proposing to increase the state rates in November. It did not make the increases it had in mind, so the activity in road construction was continued.

Hear Slag Producers

In behalf of the National Slag Association, George J. Fry said that whatever relief was granted to other heavy basic commodities should also be accorded to the companies which handle slag from the blast furnaces as concrete aggregates. One-fourth of the furnace slag is now "commercialized" by being used in concrete construction, he said. The other three-fourths are still being wasted and constitute an item of expense to the production of pig iron. He asked for the elimination of Ex Parte 74 and General Order No. 28 increases.

E. A. Harding, traffic manager for the National Slag Company of Philadelphia, said that in 1921 that company was able to operate only two of its plants and they at only 60 per cent of capacity. At present the company is operating only one plant two days a week.

"In every instance our salesmen tell us consumers tell them they will not pay the high freight rates. The industry cannot pay existing rates," he said.

"Is the necessity of an industry the test of the reasonableness of a freight rate?" asked Commissioner Esch.

"It is one of the things to be considered," said the witness. He said that at its plant on the Cornwall Railroad there are 5,000,000 tons which would be moved if a proper rate could be made. The railroads, however, he said, seem to think that high rates and no tonnage are better than lower rates and some tonnage.

Ask Reduction on Cement

Speaking for the Portland Cement Association, Mr. Billings said the cement manufacturers came with a completely new angle for consideration by the commission. The volume of cement traffic, he said, is being sustained at a high level, but from that the manufacturers conclude that cement is paying more than its proper share of the cost of transportation. In 1920, he said, the railroads hauled 96,300,000 bbl. and in 1921, 94,672,000. The capacity of the mills, he said, was 147,000,000 bbl. per annum so that at the peak of the business they were operating at two-thirds their capacity.

"We don't want to hurt the railroads," said Mr. Billings, "but we don't want the railroads to hurt us. The cement industry has completely liquidated on everything it can control."

"Your wages are lower than those paid by the railroads?" asked Commissioner Lewis.

"Oh, yes, we are paying the going wages in the communities where the mills are being operated."

Mr. Billings presented exhaustive exhibits from which he had made up index numbers for cement, freight rates, coal, fuel oil, clay and shale. He used, he said, 350 rates to make up an average. On an average haul of 150 miles the increase in freight rates, he said, was 82.5 per cent. The freight, he said, constituted 60 per cent of the delivered price. He said he didn't know what would be a fair level of prices; whether that of 1913 would be fair or some point midway between 1913 and 1920.

"Every student," declared Mr. Billings, "knows that every industry is bearing an excess burden of cost due to the freight

rates. That excess is slowing up all business." To illustrate his point he said that Illinois had recently rejected his bid for 4,000,000 bbl. of cement because the price was too high and Wisconsin 2,000,000 bbl. for the same reason.

"The only answer to all this is reduced freight rates," said Mr. Billings. "Ex Parte 74 increases should come off."

According to F. E. Paulson, rates on cement are more inequitably adjusted than rates on other heavy commodities. Therefore he advocated not merely a substantial reduction from the present level, but, if there are general reductions, proportionately greater cuts should be made in rates on cement. He gave a general review of advances made since 1913, when the 5 per cent case was started, so as to show the commissioners upon what he based his claim of disproportionate advances on cement, which, notwithstanding that ill treatment, he suggested, has continued to give the railroads a large tonnage. Mr. Paulson, in part, said:

The manufacturers of portland cement in the United States feel that the present freight rates on cement are unreasonable and that cement carries a greater burden of the aggregate transportation cost than it should. This conclusion is predicated upon the fact that as far as back as 1915 cement, which is a low-grade heavy loading commodity moving in large volume to destination points throughout the United States, paid an average car-mile earning greater than the average return from all commodities embracing such high-class freight as automobiles, furniture and low-grade freight such as sand and gravel.

Since 1915, generally speaking, the rates in Official Classification territory have been advanced to a greater extent than the rates in other territory. However, the situation with respect to Southern and Western territory, exclusive of the 1 cent advance under Ex Parte 57, is substantially the same. The general advance of 40 cents per ton authorized by General Order 28, according to our calculations, amounted to much more in the aggregate than 25 per cent.

The reason is that the preponderance of cement movement is to short-haul destinations. For instance, the largest consuming markets in the United States are New York, and the metropolitan district. One of the principal sources of supply is the Lehigh Valley District, of which Northampton, Penn., is representative. The rate from the Lehigh Valley District to Jersey City (95 miles) in 1915 was 80 cents per ton. This rate was advanced under the 5 per cent case to 84 cents per ton; under Ex Parte 57 to $1.04 per ton, and under General Order 28 to $1.40 per ton, and under Ex Parte 74 to $2 per ton. The rate from Northampton to Jersey City, therefore, is today 250 per cent of the rate in effect in 1915.

The next largest cement consuming market in the United States is Chicago, which from a cement-consuming standpoint is equal to the balance of the state of Illinois. In 1915 the rate from Buffington, Ind., to Chicago was 3 cents per 100 lb. The rate today is 7 cents per 100 lb. The rate from La Salle, Ill., one of the principal points serving the Chicago market, was in 1915 4½ cents per 100 lb., while today it is 9 cents per 100 lb. The rate from Hannibal, Mo., which previous to the several advances made in the rate from Hannibal to Chicago, was 6½ cents per 100 lb., while today the rate from Hannibal to Chicago is 17½ cents per 100 lb. The present rate from Buffington to Chicago is 233 per cent of the rate in effect prior to General Order 28. The rate from La Salle to Chicago is 200 per cent of the rate in effect prior to General Order 28. The rate from Hannibal to Chicago is 270 per cent of the rate in effect prior to General Order 28.

Prior to the advances in rates, practically all of the cement moving into Chicago was transported by rail. It will be shown by a subsequent witness that a substantial proportion of the cement now consumed in Chicago is now moving into that point by motor truck without any rail transportation. Similar conditions will be found at other large cement consuming centers, such as St. Louis, Minneapolis (137 miles, from 6 to 13 cents), Kansas City (108 miles, from 5 to 12 cents), Philadelphia (71 miles, $1.20 to $2.70 per ton), Cincinnati (126 miles, from 6 to 13½ cents), Baltimore, New Orleans (from 10 to 23 cents) and San Francisco (from 75 cents per ton to $1.50 per ton).

The cement producers of the United States feel that there should be a substantial reduction from the present level of freight rates, in and of themselves, and which reduction, due to the showing that we have made, ought to be proportionately greater with respect to cement than may be applied to commodities whose present rates are more equitably adjusted with reference to the commerce of the United States as a whole, and furthermore, regardless of the fact that no reduction may be necessary or may be made on other commodities, that coment, due to its peculiar characteristics, and the place it holds in our economic development and due to the fact that the present rates imposed are excessive proportionately and per se should receive a substantial reduction and the level of rates to be imposed in the future, according to our judgment, should not exceed the level of rates in effect prior to Ex Parte 74.

Glass Man Testifies

J. M. Belleville, general traffic manager for the Pittsburgh Plate Glass Co., spoke not only for the competitors of his own company in the manufacture of plate glass but also for the American Window Glass Co., a competitor in the furnishing of material for window frames. Mr. Belleville said:

"Reductions on raw materials would do us more good than reductions on finished glass. Sixty per cent of a batch of glass is sand. I can see no reason for allowing a lower rate on building than on glass sand, especially when, as is the fact, the railroads obtain two hauls on glass sand. It comes in as a raw material and goes out as a finished product. Building sand moves only once."

Asphalt Producer Heard

Asphalt producers asked for a rate treatment for asphalt. They did not attack the rates on cement, but indicated that they thought they should not pay more than cement manufacturers pay for the movement of their product.

J. E. Pennybacker, secretary for the Asphalt Association, said: "Cement bears only about two-thirds as great a transportation burden. There are no loss and damage claims on asphalt at all." His remedy was the removal of Ex Parte 74 increases and the establishment of a fair relationship between it and its competing materials.

J. W. White, for the International Agricultural Corporation, said that a substantial reduction of about 20 per cent should be made in the South. Instead of the railroads thinking of reduction, he said, it was reported that a well defined move was afoot to raise the rates on fertilizer materials in the South. Phosphate rock tonnage declined sharply when the advances permitted by Ex Parte 74 went into effect, he said, because the farmers would not pay the high rates. He said the railroads had granted relief in a number of instances.

J. R. Bent, director of the phosphate rock activities of the Illinois Agricultural Association, said that raw phosphate rock is one of the fertilizer materials Illinois has been using more generally than any other. That resulted from the efforts of the University of Illinois. He asked for material reductions and said he hoped there would be no unfavorable or inadequate action. He said the price, f.o.b. mines, in Tennessee, prior to Ex Parte 74, was $8 per ton and the freight $4.49. Now the price is $5 and the freight $5.985, the prices and freight being averaged. "Farmers cannot and will not stand such maladjustment," said Mr. Bent. "The result of the high rates is that the crushed phosphate rock industry in Tennessee is being killed and the farming community is being deprived of what it has been taught, during the last 20 years, to use."

Million Dollar Sand Co. Organized

A NEW million dollar concern composed of five of the leading sand companies in the Ohio valley, two of which were operated principally by Wheeling, W. Va., capital and located there, has just been organized. It will be known as the Ohio River Gravel Co., with its main base of operations at Parkersburg. The final deal was consummated when the Armstrong Sand Co. of Wheeling was sold to the Ohio Valley Sand Co. for $150,000. The other companies are the Wheeling Sand and Gravel Co., Wheeling; New Martinsville Sand Co., New Martinsville; Parkersburg Sand Co., Parkersburg, and the Marietta Sand Co., Marietta, Ohio.

The stockholders have already elected directors as follows: E. A. Brast, Parkersburg; A. E. Frosch, Wheeling; C. H. Toothman, Fairmont; J. C. McClain, Point Marion, Pa., and officers of the company. The officers are Charles Corliss, president, New Martinsville; George C. Ross, vice-president, and A. P. Turley, secretary and treasurer, Parkersburg, and George C. Ross, general manager, New Martinsville.

The formation of the new company was consummated largely, it is said, upon the fact that West Virginia will need much sand and gravel in connection with its road program and the firm believes that it will be in a position to take care of any amount of material it may be called upon to furnish.

Buffalo's Specifications for Coarse Aggregates

AMENDMENTS to the building laws of Buffalo, N. Y., have been adopted to the effect that "coarse aggregates shall consist of crushed stone, slag or gravel which is retained on a screen having ¼-in. mesh and graded in size from small to large particles. The maximum size shall be such that all the aggregates will pass through a 1¼-in. ring. All aggregates shall be clean, hard, durable and free from deleterious material."

Editorial Comment

An Appreciation

The announcement of the resignation, to take effect March 1, of E. Guy Sutton, executive secretary of the National Association of Sand and Gravel Producers, was received by the convention of the industry in New Orleans with sincere regret; and we believe that such regret will be universal. There has never been anything spectacular in Mr. Sutton's make-up or accomplishments, but everybody familiar with the progress of the industry in the last five years will recognize that his work has resulted in a tremendous step toward putting the industry "on the map." From a scattered group of business men—an industry generally considered too insignificant to have common interests, to say nothing of national issues—the National Association has grown under his thoughtful and persistent nursing to a strong, compact organization, which has made known its existence to several departments and bureaus of the federal government, various state governments, and other national professional and trade associations.

Mr. Sutton's success in dealing with the government and other organizations came from his intimate knowledge of the industry and his unwavering faith in the righteousness of its contentions. He has never attempted to accomplish results by so-called political methods, but always open-handedly and above board; and because of this attitude he has won the confidence and respect of all with whom he came in contact. The full measure of his service to the industry will not be generally appreciated until the time comes when sand and gravel producers acquire a historical viewpoint. When in the future they look back on the first steps by which the industry acquired national dignity, E. Guy Sutton and his work will mark an epoch.

Freight Issue Misunderstood

Secretary Hoover is quoted as saying that maintenance of the present prohibitive freight rates on basic raw materials constituted "an economic crime." Yet Congressman Sanders, of Indiana, went all the way from Washington to New Orleans to tell the national convention of sand and gravel producers that their only hope of getting lower freight rates was to work for lower operating costs for the railways. He painted, in the congressional type of oratory, the need of the railways for more revenue and their vital influence on the public welfare. He deplored any change in the law which would return to the state public utility commissions jurisdiction over local freight rates.

Congressman Sanders is the chairman of the steering committee, and other important committees, of the National House of Representatives. He is reputed to come from a district where sand and gravel production is an important industry. However, he is, naturally, a very busy man, and has many interests. Therefore he probably may be pardoned for a total lack of appreciation of the real sand and gravel freight-rate issue.

The kernel of the freight-rate matter is that *prohibitive* rates do not and never will bring the railways income, or revenue. The railway officers readily recognize this in the case of transcontinental rates on Pacific Coast lumber, or some other commodity which can go by way of the Panama Canal, or the Mississippi River, or some other way. In a thousand and one other instances in every locality they are not able to, or have refused to, recognize it, and consequently are losing revenue in little driblets, which amount to hundreds of millions in the aggregate. At the same time they have hundreds of thousands of idle cars, eating up money for interest and depreciation. The railway officers may think, as they state in public, that they are moving all the material they would move anyhow in these dull times. But any one at all familiar with the sand, gravel and crushed stone industries knows that they are actually losing millions of tons of traffic to roadside pits.

It is an economic crime, as Mr. Hoover says, because not only are the railways depriving themselves of needed revenue, but they are compelling the public to invest capital in producing enterprises which are not economically necessary, and therefore diverting just so much capital from other lines where it is needed.

Of course, to a certain degree any radical change in freight rates disarranges industry and will eventually result in some kind of a redistribution of industry—whether the industry is making shoes or sand and gravel. But the other factors which involve a change in the location of a shoe factory are the availability and wages of skilled labor, sources of raw materials, relative cheapness of power, and most of all, the relative location of the principal large markets. The freight rate on the finished product is insignificant. But what are the like factors which influence the change in location of a gravel plant? *There is only one.* It is the size of the freight bill on the finished product.

Whether the state utility or railway commissions should have jurisdiction over intrastate rates is a debatable issue. It should be obvious, however, that the same body which has to deal with the problems of railways as a national unit, never can and never will deal with specific commodities in specific localities on their merits. If the railway officials are wise they will forestall a return to former chaotic conditions under state commission rulings by investigating and verifying for themselves some of the allegations regarding loss of revenue by prohibitive rates before it is too late.

Accident Prevention

Good Results from Accident Prevention at Marquette Plant*—Part II

By T. F. Halpin, Employment Manager

We also had bulletins in the form of letters which were posted at intervals throughout the month, informing the men of the status of the accident record up to that time and urging them to keep up the good work. This, and the constant plugging along by every workman, established a record for our plant. The 26th of the month a man who, during a shut-down for repair work was doing work in the mine with which he was not entirely familiar, received a small injury from which he lost six days. This was the only accident for December. The monthly average days lost for the first 11 months of the year was 141 and the monthly average lost time accidents 8. During the first 11 months we also had two permanent disability cases and one fatality. It was quite a revelation to us who conducted the campaign to see how every man took hold of the proposition and the interest they took in trying to complete the month without an accident. There was no attempt on the part of anyone to hide small injuries—in fact, the records showed that more men were treated for small injuries that month than for any previous month. The men took no chance on getting infection in small wounds and losing time as a result. Each member of the workmen's committee was highly enthused and did excellent work by being alert all the time to see that no dangerous practices were indulged in.

The important point I would like to impress on you is that the excellent work started in December has been continued ever since; in fact, in April only two days were lost, due to an accident—a record which was better than our "No Accident Month" in December. The men seem to have a clearer understanding of the whole question and of what really is the fundamental factor in the prevention of accidents. The employes of our mine felt very bad over the one accident which happened in that department in December, and they were not satisfied until they showed the rest of the plant that they could make a record by holding a campaign of their own. They did this and they have not had a single time-lost accident in the mine since February 1, a period of 100 days—a record unheard of during the lifetime of our plant. This is more remarkable when we go over our records and find that we seldom went through a week in this department without having some one off from work due to an accident.

From December 1, 1919, to May 1, 1920, we had 31 accidents, causing a loss of 761 days, and in addition one fatality and two permanent disabilities. During December 1, 1920, to May 1, 1921, we have had 18 accidents, causing the loss of 144 days, no fatal accident and no permanent disabilities. This shows a reduction in accidents of 81 per cent and a financial saving of 90 per cent based on what our insurance premiums would have cost.

We believe that we have finally found the right method by which it is possible to reduce accidents to a minimum. We still have many things to do in respect to building guards and improving equipment, but, in the meantime, we intend never to forget that the man is the real factor.

We should all remember that safety work in its last analysis is purely an advertising and selling proposition and that unless someone is on the job every moment the records will soon show the results. We have had many disappointments and in times past it frequently looked as if we were confronted by unsurmountable obstacles and by the thought that they would never appreciate the benefits that could be derived from this work. But in every field of endeavor the rewards usually bear a direct ratio to the difficulties to be overcome, and last of all there is a great deal of satisfaction in such an accomplishment that means more than money or success in a commercial way. There is a feeling of work well done, of having your plant a better place to work in and of having assisted in alleviating the pain and suffering of those who are needlessly injured.

(Concluded)

*Abstracted from paper read at spring meeting of Portland Cement Association, Chicago, 1921.

How Many

Of These Liabilities Do YOU Carry On YOUR Books and How Much Do They Cost You Annually?

DO you know that the cost of a single serious accident is greater than your membership in the National Safety Council would amount to for a period of fifty years? That the National Safety Council's educational service can help you to reduce these and all other accidents by 75 per cent? That all bulletins, pamphlets, booklets, in fact the Council's entire service is prepared out of the combined and accumulative experience of almost 4,000 of the most progressive industrial concerns of America?

IN other words, every bulletin portraying an accident is worked up from the actual experience of some concern. The Council has not only the experience of this one concern to draw from, but of every other concern in its membership engaged in the same line, and of all of those engaged in lines having similar hazards.

THE cost of membership is small—the advantages many. Write the Business Division for details of membership.

National Safety Council

Co-operative Non-Commercial

168 North Michigan Avenue, Chicago, Ill.

Safety and Efficiency One and the Same

THAT safety and efficiency are one and the same thing is today becoming recognized as a fact. A machine that is inefficient or faulty is unsafe. Edwin Higgins, in his story of "The Human Element in Mine Operation," declares:

"Practically every accident that happens in the mine, from a bruised finger to a fatality, costs something in loss of time and demoralization of work. In some parts of the United States, the men all walk out of the mine in case of a fatal accident and do not return until the dead man is buried. When a man is seriously injured he requires the aid of others. His work stops, and the work of those coming to his assistance stops. There is a further loss from the curiosity-mongers, who want to know what is going on, and also from those required to carry the injured man from the mine to the first-aid room."

This principle of safety and efficiency is equally applicable to the rock products industry. A faulty machine is an accident liability—there can be no question of it. It will require some educational work on the part of employment managers to make this evident to the worker. But when it is made evident, it will be one means of lessening accidents and also help in keeping the plant up to its needed efficiency from the standpoint of production.

Carelessness and ignorance are the parents of most accidents. The poor plea that nearly every accident is an act of Providence is being dumped into the discard. Accidents cannot be wholly prevented, but it is universally agreed that they can be brought down to a very low minimum if their causes are well understood and proper precautions exercised by the worker. The "eternal vigilance" saw has by no means lost its cutting power.

New Machinery and Equipment

Conveyor Weightometer

THE Merrick conveyor weightometer, manufactured by the Merrick Scale Mfg. Co., Passaic, N. J., is an automatic scale which mechanically weighs and records the weight of all material passing over a belt, bucket or pan conveyor. A portion of the conveyor is suspended from the scale and the weighing does not interrupt the transit of the material. As the material rides over this suspended portion it actuates the machines and the net weight is recorded upon a continuous automatic counter.

As no attendant is required, the chances of error are removed and the operating charge eliminated. No motor, generator or other outside attachments are necessary. The scale is shipped as a complete unit. All that is required is to install it over the conveyor upon simple supports of either angle iron or timber and connect up a small sprocket; the scale accomplishes the rest and does the weighing with an accuracy of 1 per cent of the true weight, states the manufacturers.

Many installations have been made in the cement field, weighing rock, shale, sand, gravel, stone, finished cement, phosphate rock, fertilizer, etc. The company states that 80 per cent of the installations are made by the users themselves, aided by a complete set of instructions and photographs.

Frictionless Roller Sheave

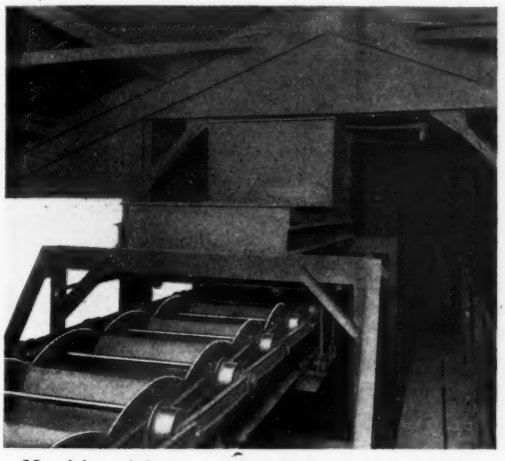
ONE of the latest developments in roller sheaves, announces the Chicago Mining Sheave and Roller Co., 2320 West Chicago avenue, Chicago, is the frictionless roller sheave illustrated herewith. There is a type for every requirement. It is built to stand up under long and hard usage, as it has a double bearing and is of heavy construction.

A patented oil reservoir is a feature of the sheave and a single occasional oiling is sufficient to keep the roller sheave running smoothly. The base and roller are of cast iron, but the center core, which gets the most of the strain, is of the strongest steel.

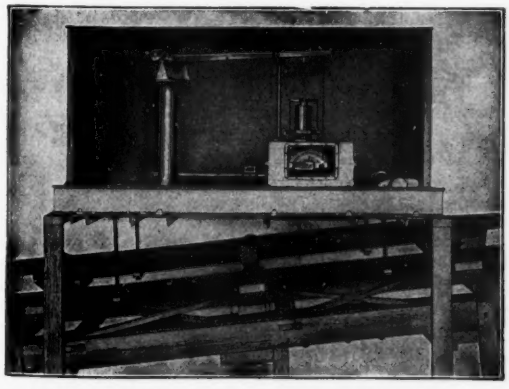
Double-Scraper Drag Machine

THE double scraper drag machine herewith illustrated which the Erie Clutch and Pulley Co., Erie, Pa., has put on the market is designed, says the company, to take the place of horses in gravel pits, or other places where gravel, sand or dirt is scraped.

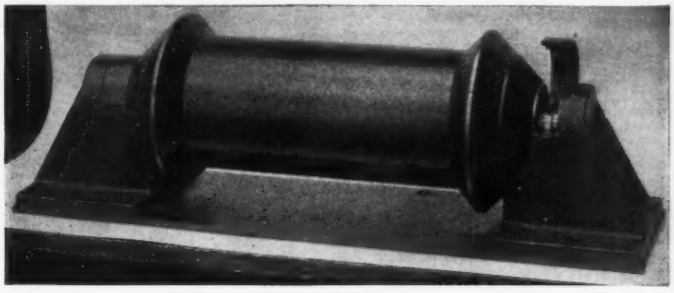
The machine has two scrapers, one going toward the machine with a load while the other is returning empty. The machine is operated entirely with one lever —No. 1 scraper goes forward and No. 2 returns; by pulling the lever back, No. 2 goes forward and No. 1 returns. The machine can be run either by gasoline, motor or from a line shaft.



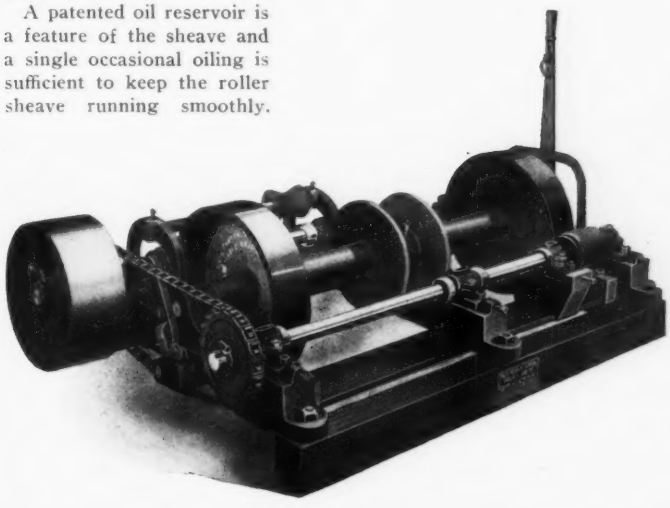
Merrick weightometer installed on pan conveyor



Merrick weightometer installed on belt conveyor. Front dustproof cover removed



Frictionless roller sheave



Rear view of the drag machine

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.00	1.00	1.00	1.00	
Buffalo, N.Y.	1.50 per net ton all sizes—Winter prices from stock					
Burlington, Vt.	1.00		2.50	2.00	2.00	
Chaumont, N. Y.			1.75	1.25	1.25	1.25
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	
Coldwater, N. Y.	1.50 per net ton, all sizes					
Eastern Penna.	.75	1.60	1.60	1.60	1.60	1.60
Munns, N. Y.	1.00	1.25	1.25	1.25	1.25	1.25
Western New York	.70	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45		
Alton, Ill.	2.00		1.50	1.35	1.35	
Bettendorf, Ia.	All sizes, 2.00 cu. yd. f.o.b. quarry					
Buffalo, Iowa	1.00	1.50	1.40	1.30	1.35	1.35
Chicago, Ill.	1.20	1.60	1.20	1.20	1.20	1.20
Dundas, Ont.	1.00	1.35	1.35	1.35	1.10	1.10
Greencastle, Ind.	1.25	1.20	1.10	1.10	1.10	1.10
Illinois, Southern	1.75	1.60	1.50	1.50	1.40	
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.35	1.25	1.35	1.15	1.10	1.10
Lannon, Wis.	.90	1.00	1.00	1.00	1.00	1.00
Marblehead and Brillion, Wis.	1.10		1.20	1.10	1.10	
Montrose, Ia.	1.35	1.50	1.60	1.55	1.50	
River Rouge, Mich.	1.00	1.15	1.15	1.15	1.15	1.00
Sheboygan, Wis.	1.00	1.10	1.10	1.05	1.10	
Southern Illinois	1.40	1.35	1.35	1.35	1.35	
Stolle, Ill. (I. C. R. R.)	1.55	1.55	1.55	1.30@1.35	1.50	1.50
Stone City, Iowa	.75		1.40	1.35	1.30	
Toledo, Ohio	1.84	1.99	1.99	1.99	1.84	1.84
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
	Prices include 90c freight					
Valmeyer, Ill.	1.60	1.30	1.30	1.30	1.30	1.30
Waukesha, Wis.	all sizes 1.10 per ton					
SOUTHERN:						
Cartersville, Ga.		2.00		1.45	1.45	
Chickamauga, Tenn.	1.00	.80	.80	.80	.70	.65
Dallas, Texas	1.10	1.25	1.25	1.25	1.10	1.10
Ft. Springs, W. Va.	1.20	1.50	1.75	1.60	1.45	1.30
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	
Gainesville, Ga.	1.00	1.25	1.25	1.25	1.25	1.25
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	
Ladds, Ga.	2.00	2.00	2.00	1.50	1.50	1.50
Morris Spur (near Dallas) Tex.	1.10	1.25	1.25	1.25	1.25	1.25
Portland, Ga.	.60@1.00		(All other sizes 1.00@1.25)			
Shephard, Tenn.	1.00@1.25	1.00@1.25	1.00@1.25	.75@1.00	.75@1.00	
WESTERN:						
Atchison, Kans.	.50	2.10	2.10	2.10	2.10	2.10
		(Rip-rap.		1.80 per ton)		
Blue Springs and Wymore, Neb.	.20	1.65	1.60	1.55	1.45	1.40
Cape Girardeau, Mo.	1.50		1.50	1.50	1.25	
Kansas City, Mo.	1.00	1.80	1.80	1.80	1.80	1.80

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	
Branford, Conn.	.60	1.50	1.25	1.15	1.10	
Bound Brook, N. J.	2.30	2.50	2.20	1.90		
Dresser Jct., Wis.	1.25	2.25	2.25	1.75	1.50	
Duluth, Minn.	.75@1.00	2.25	1.90@2.00	1.50	1.35@1.50	1.35@1.50
Dwight Station, Calif.			.75@1.00—all sizes			
E. Summit, N. J.	2.30	2.60	2.40	2.00	2.35	
Eastern Mass.	.60	1.95	1.75	1.50	1.50	1.50
Eastern New York	1.00	1.80	1.70	1.50	1.50	1.50
Eastern Penna.	1.25	1.80	1.70	1.60	1.50	1.50
Montrose, Ia.	1.50					
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60@ .80	1.60@1.75	1.50	1.25	1.10	
Oakland, Calif.	1.75	1.75	1.75	1.50	1.50	1.50
Richmond, Calif.	.50*		1.75*	1.50*	1.50*	
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	2.00	2.10	2.00	1.80	1.75	
Westfield, Mass.	.60	1.35	1.30	1.20	1.10	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Alexandria Bay, N. Y.	1.60		1.30	1.50	1.30	
Columbia, S. C.—Granite	.75		2.75	2.50	2.35	
Dell Rapids, S. D.—Granite	.75	1.85	1.75	1.70	1.70	
Dundas, Ont.—Flint	1.00	1.50	1.50	1.50	1.25	1.20
Eastern Penna.—Sandstone	1.00	1.75	1.75	1.50	1.50	1.50
Eastern Penna.—Quartzite	.90	1.60	1.40	1.30	1.30	1.30
Holton, Ga.—Granite	.40		2.50	2.25	2.25	2.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30		1.20	
Los Angeles, Cal.—Granite		1.25@1.50	1.15@1.40	1.15@1.40		
Macon, Ga.—Granite	.50		2.50	2.25	2.00	1.25@1.90
Middlebrook, Mo.—Granite	3.00@3.50		2.00@2.25	2.25@2.80		1.25@1.50
Red Granite, Wis.	1.35	1.40	1.30	1.50	1.20	
Sioux Falls, S. D.—Granite	.75	1.85	1.75	1.70	1.70	
Stockbridge, Ga.—Granite	.50	2 00	1.90	1.75	1.75	
Utley, Wis.—Red Granite	1.35	1.40	1.30		1.20	

*Cubic yard. †Agrl. lime. ||R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk 2.50

Coldwater, N. Y.—Analysis, 56.77% $CaCO_3$, 41.74% $MgCO_3$, 70% thru 200 mesh, 95% thru 50 mesh, sacks 4.00; bulk 3.00

Grove City, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$—100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk 3.00

Hillsville, Pa. — Analysis, 96.25% $CaCO_3$—70% thru 100 mesh; sacks 4.50; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.50; bulk 2.75

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Texas, Md.—Analysis, 58.02% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

Waltord, Pa. — 50% thru 100 mesh, 60% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 5.00—cloth, 5.25; bulk .. 3.50

Williamsport, Pa. — Analysis, 88-90% $CaCO_3$, 2-4% $MgCO_3$—50% thru 50 mesh; paper, 4.75; bulk 3.75

CENTRAL:

Alton, Ill. — Analysis, 96% $CaCO_3$, 0.3% $MgCO_3$—90% thru 100 mesh 7.75

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh ..... 1.60@2.00

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Buffalo, Ia.—90% thru 4 mesh 1.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$ (90% thru 50 mesh, 2.00), 50% thru 4 mesh 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh 1.00

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh ..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh 2.00

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh 1.45

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh 2.00

Marblehead, O.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$—52.4% thru 100 mesh, 59% thru 50 mesh, 100% thru 4 mesh; sacks, 4.75; bulk 3.00
Limestone screenings; bulk 1.50

McCook, Ill.—Analysis, 54.10% $CaCO_3$, 45.04% $MgCO_3$—100% thru ¼-in. sieve, 78.12% thru No. 10, 53.29% thru No. 20, 38.14% thru No. 30, 34.86% thru No. 50, 22% thru 100 ..... 1.50

Milltown, Ind. — Analysis, 91.59% $CaCO_3$, 4.87% $MgCO_3$—33.6% thru 100 mesh, 40% thru 50 mesh ..... 1.25@1.65

Mitchell, Ind. — Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$ — 60% thru 100 mesh, all thru 10 mesh 1.25

Montrose, Ia.—50% thru 100 mesh 1.35

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh ..... 1.50@2.00

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

Piqua, O. — Analysis, 82.8% $CaCO_3$, 8.2% $MgCO_3$; neutralizing power in terms of calcium carbonate, 95.3%—80% thru 100 mesh ..... 3.25@5.00
50% thru 50 mesh 2.00

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk ..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R. — Thru ½-in. mesh — Analysis, 89.61% to 89.91% $CaCO_3$, 3.82% $MgCO_3$ 1.75

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 100 mesh ..... .75

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh 1.50
Waukesha, Wis.—No. 1 kiln dried..... 2.00
No. 2 Natural..... 1.75
Whitehill, Ill. — Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$—90% thru 100 mesh 5.00
90% thru 50 mesh 1.40
Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk.... 4.25

SOUTHERN:

Barber, Va.—Analysis, 92 to 98% $CaCO_3$—Bags, 6.50; bulk..... 4.50
Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh..... 4.75
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$ — 50% thru 100 mesh 2.00
90% thru 4 mesh..... 1.50
Cartersville, Ga.—Analysis, all thru 10 mesh ..... 2.00@2.50
Claremont, Va. (Marlime) — Analysis, 90% $CaCO_3$, 2% $MgCO_3$—(90% thru 100 mesh, $4.00), 50% thru 100 mesh 3.50
Dittlinger, Tex. — Analysis, 99.09% $CaCO_3$, .04% $MgCO_3$—90% thru 100 mesh ..... 2.00@3.00
90% thru 4 mesh ..... 1.00@2.00
Ft. Springs, W. Va.—50% thru 100 mesh 3.00
Grevania, Ga.—Analysis, 95% $CaCO_3$, no $MgCO_3$—50% thru 100 mesh..... 2.50
Hot Springs, N. C.—Agricultural limestone; sacks, 4.25; bulk..... 3.00
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh..... 2.00
90% thru 50 mesh..... 1.50
Ladds, Ga.—90% thru 50 mesh..... 2.00
Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk..... 3.00
Mascot, Tenn.—Analysis 52% $CaCO_3$, 38% $MgCO_3$—80% thru 100 mesh.... 3.00
All thru 10 mesh..... 2.50
80% thru 200 mesh..... 4.50
Paper bags, $1.50 extra per ton; burlap, $1.00 extra per ton.
Maxwell, Va. 2.50
Ocala, Fla. — Analysis, 98% $CaCO_3$—75% thru 200 mesh..... 4.50

WESTERN:

Colton, Calif.—Analysis, 90.95% $CaCO_3$, 2-3% $MgCO_3$—all thru 14 mesh—bulk Sacks, 15c extra, returnable. 4.00
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh ..... .50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk..... 1.80
Terminous, Calif. — Analysis, 97.3% $CaCO_3$, .04% $MgCO_3$—65% thru 200 mesh, 90% thru 100 mesh, 95% thru 80 mesh, 100% thru 50 mesh; sacks, 5.00; bulk 4.50
Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Baltimore, Md. ..... 2.25@2.75
Berkley Springs, W. Va..... 2.00@2.25
Cedarville and South Vineland, N. J.—Damp, 1.75; dry..... 2.25
Cheshire, Mass. ..... 5.00@7.00
Hagerstown, Md. 1.75
Hancock, Md.—Damp ..... 2.50@3.50
Klondike and Pacific, Mo..... 2.00@2.50
Mapleton, Pa. ..... 2.25@2.50
Massillon, Ohio 3.00
Millington, Ill. 1.75
Mineral Ridge, Ohio..... 2.50@3.00
Montoursville, Pa.—Green, washed..... 2.00
Oregon, Ill.—Large contracts..... 1.75
Ottawa, Ill. ..... 1.25@1.50
Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00
Rockwood, Mich. 2.75
Round Top, Md.—(washed-screened).... 1.25
St. Mary's, Pa.—Unwashed..... 2.25
Thayers, Pa.—Washed 2.00
Utica, Ill. ..... 1.25@1.75
Zanesville, Ohio ..... 2.00@2.50

FOUNDRY SAND:

Albany, N. Y.—Sand blast..... 4.00
Molding fine, coarse and brass..... 2.25@2.50
Allentown, Pa.—Core and molding fine 1.50@1.75
Arenzville, Ill.—Molding fine..... 1.40@1.60
Beach City, O. — Core, washed and screened ..... 2.00@2.50
Furnace lining ..... 2.50@3.00
Molding fine and coarse..... 2.25@2.50
Bowmantown, Pa.—Core ..... 1.35@1.50
Molding, coarse ..... 1.80@2.00
Cleveland, O.—Molding coarse..... 1.50@2.00
Brass molding ..... 1.50@2.00
Molding fine ..... 1.50@2.25
Core ..... 1.25@1.50
Columbus, O.—Core ..... .30@1.25
Sand blast ..... 4.50@5.00
Furnace Lining 2.00
Molding fine ..... 2.00@2.75
Molding coarse ..... 1.75@2.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge and So. Heights, Pa.	.....	1.15	1.15	1.15	.70	.70
Attica, N. Y.	.75	.75	.75	1.00	1.00	1.00
Buffalo, N. Y.	1.10	.95	.85	.....	.85	.....
Erie, Pa.	.....	1.00	.....	1.15	.....	1.25
Farmingdale, N. J.	.48	.48	1.30	1.30	1.30	.....
Hartford, Conn.	.90	.....	1.25	1.15	1.15	1.15
Leeds Junction, Me.	.....	.50	1.75	1.50	1.35	1.25
Ludlow, Mass.	.75•	.75•	1.70	.....	1.50•	1.50•
Philadelphia, Pa.	.75	.75	.....	1.40	1.25	.....
Pittsburgh, Pa.	.....	1.30	1.30	1.30	.85	.85
Portland, Maine	.....	.50	1.75	.....	1.35	1.35
Texas, Md.	.....	1.00	.....	Pure white sand, 1.50		
Washington, D. C.	.75	.75	2.00	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.	.....	.85	.....	.....	.....	.....
Anson, Wis.	.50	.50	.....	.....	.....	.90
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.	.....	.60	.70	.70	.70	.70
Beloit, Wis.	.....	.50	.....	.....	.50	.....
Chicago, Ill.	.....	1.75@2.23	1.75@2.43	.....	.....	.....
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.80@1.00	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	100@1.25
Des Moines, Ia.	.....	.40@ .65	1.60	1.60	1.60	1.60
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.40	.....	1.25	.....	.90	.....
Elgin, Ill.	.....	.80	1.00	.80	.80	.80
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Ft. Dodge, Ia.	.....	1.22	.....	2.17	.....	.....
Grand Rapids, Mich.	.....	.50	.....	.85	.....	.75
Greenville, Mechanicsburg, O.	.60	.50	.50	.50	.60	.60
Hawarden, Ia.	.....	.50	.....	.....	1.60	.....
Hersey, Mich.	.50	.50	.....	.....	.70	.70
Indianapolis, Ind.	.60	.60	.....	1.50	.75@1.00	.75@1.00
Janesville, Wis.	.....	.65@ .75	.....	.....	.65@ .75	.....
Le Mars, and Doon, Ia.	.....	.90	.....	1.80	.....	.....
Libertyville, Ill.	.....	.70	.....	.70	.70	.....
Mankato, Minn.	.50	.50	.75@1.50	.75@1.50	.75@1.50	.75@1.50
Mason City, Ia.	.....	.55	1.80	1.55	1.55	1.55
Milwaukee, Wis.	1.15	1.15	1.25	1.25	1.25	1.25
Minneapolis, Minn.	.50	.50	1.50	1.35	1.25	1.25
Moline, Ill.	.60@1.00	.60@1.00	1.60	1.60	1.60	1.60
Riton, Wis.	.....	.40	.....	.....	.50	.50
St. Louis, Mo., f. o. b. cars....	1.20	1.52½	1.67½	1.47½	1.42½	1.42½
St. Louis, Mo., delivered on job ..	2.05	2.20	2.35	2.15	.....	2.10
Summit Grove, Clinton, Ind.....	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.	.60		All other sizes, .70 per ton			
Winona, Minn.	.60	.50	1.75	1.50	1.25	1.25
SOUTHERN:						
Alexandria, La.	.60@ .80	.50@ .75	.....	.....	.85@1.50	1.20@1.50
Birmingham, Ala.	1.48		all gravel—1.88			
Charleston, W. Va.	.....		(Sand, 1.40@1.50; gravel, 1.50			
Estelle Springs, Tenn.	1.15	1.10	.....	.....	1.00	.85
Ft. Worth, Tex.	.....	2.00	.....	2.00	.....	2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	1.00@1.15	1.00@1.15	.....	2.12	1.92	1.74
Lake Weir, Fla.	.....	.75	.....	.....	.....	.....
Macon, Ga.	.....	.50@ .75	.....	.....	.....	.....
Memphis, Tenn.	1.12	1.12	.....	.....	.....	1.95
N. Martinsville, W. Va.	1.10	1.10	.....	1.30	.....	.90
New Orleans, La.	.....	.50	.....	.....	1.00	.....
Pine Bluff, Ark.	.90@1.25	1.00@1.20	Washed gravel, all sizes, 1.75			
Roseland, La.	.25	.....	.85	.....	.....	.....
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Jedburg, Mo.	.70	1.20	.95	.75	.75	.70
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Los Angeles, Calif.	.....	.90	1.50	1.50	1.25	1.25
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.10•	.90•	.....	.....	1.25•	.....
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.	.....	1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50•	1.50•	2.00•	1.50•	.....	1.50•
Yutan, Neb.	.40		Bank run .40			

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	.75
Boonville, N. Y.	.60@ .80	.....	.55@ .75	.....	.....	1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Ia.			.80 per ton—1.20 washed			
Detroit, Mich.	1.10•	.....	.....	.....	.....	.....
Dudley, Ky. (Crushed Sand)..	.....	1.05	.....	1.00	.....	.....
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.			Washed gravel .66			
Estelle Springs, Tenn.	.....	.....	.....	.....	.....	.85
Fishers, N. Y.	.60@ .65	.....	.....	.60	.....	.50
Glenville, N. Y.	.....	.....	.....	1.00•	.....	.....
Hamilton, O.	.....	.....	.45 per cu. yd. in pit			
Hartford, Conn.	.....	1.00•	.....	.....	.....	.....
Hersey, Mich.	.....	.....	.....	.50	.50	.....
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Janesville, Wis.	.....	.65	.....	.....	.65@ .75	.....
Lindsay, Tex.	.....	1.45	.....	.....	.....	.55
Oxford, Mich.	.....	.....	.....	.65	.65	.....
Pine Bluff, Ark.			Road gravel .60			
Rochester, N. Y.	.60@ .75	.60@ .75	.....	.....	.50@ .65	.50@ .65
Roseland, La.	.....	.75	.....	.....	.....	.....
Saginaw, Mich., f. o. b. cars....	.....	.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.57½			
Summit Grove, Ind.	.60	.60	.60	.60	.60	.60
Waco, Texas	.....	.80	.....	1.50	.....	1.30
Winona, Minn.	.....	.....	.70	.70	.70	.70
Yardville, N. J.	.....	.50	.....	.....	.....	.....
York, Pa.	.....	1.10@1.20		(crushed rock sand)		

•Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.10	2.50	1.35	1.35	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.90	1.50	1.00	1.00	1.00	1.00
Erie, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, $1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.05	1.75	Other grades 1.55½				
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	2.93	2.30	2.49	2.49	2.49	2.30	2.30
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.00@1.25	1.15	1.05@1.10	.85@1.00	.85@ .90
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Va.	2.50	1.00	1.60	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN:								
Adams, Mass.			7.00					3.50
Bellefonte, Pa.			8.00	9.00	8.00		7.50	
Berkley, R. I.			14.00					2.50
Buffalo, N. Y.		11.00	11.00	11.00			9.50	2.00*
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.50	
Paxtang and LeMoyne, Pa.					5.00		4.50@5.00	
Rockland, Maine						8.00		
Union Bridge, Md.			13.00		5.50			
West Rutland, Vt.	13.50	12.25	7.50@12.25	14.00			11.00	3.50
West Stockbridge, Mass.			15.00					
Williams and Blue Bell, Pa.			11.25					
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		9.50	9.50	9.50 (mfrs.)			7.50	
CENTRAL:								
Delaware, Ohio	10.50	8.50	7.50	10.00	7.50		7.50	1.60
Geneo, Ohio	10.50§							
Gibsonburg, Ohio	10.50§	8.50	8.50		6.75	8.75		
Huntington, Ind.	10.50	9.00	8.50				8.00	1.70*
Knowles and Valders, Wis.			12.50		5.00	9.00		
Marblehead, Ohio	10.50	8.50		11.00	6.75		8.00	1.70*
Mitchell, Ind.		11.00	11.00	11.00	9.50		8.50	1.45
Sheboygan, Wis.					5.50	8.50		
White Rock, Ohio	10.50				6.75	8.75		
Woodville, O. (dlrs.' price)	10.50a	8.00a	8.00a	9.00a	8.25		8.00	1.60
SOUTHERN:								
El Paso, Tex.							12.50	
Knoxville, Tenn.	11.00	9.50	9.50				7.50	1.30
Ocala and Zuber, Fla.	13.00	12.50	11.00	12.50	1.50	7.00		
Sherwood, Tenn.	11.00	9.50	9.50	9.50	2.50		7.50	1.30
Staunton, Va.					8.00		9.50b	1.60
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. Mex.					12.00	15.00		2.00c
Los Angeles, Calif.			15.00‡				16.00	
San Francisco, Calif.	22.00		15.00@16.00	25.00			16.00	2.15*
Tehachapi, Calif.						15.00	13.00	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl.

Miscellaneous Sands

(Continued from preceding page)

Stone sawing	1.50
Traction	1.00
Brass molding	2.75
Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Molding coarse	1.50@1.75
Brass molding	1.75
Dunbar, Pa.—Traction, damp	2.35
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Falls Creek, Pa.—Glass sand	2.50
Furnace lining, traction and molding coarse and fine, and core	2.00
Sand blast	3.50
Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.25@4.25
Traction sand	.50
Franklin, Pa., and Utica, Pa.—Traction	2.00
Brass molding	2.75
Core	1.25@2.00
Molding fine	2.75
Molding coarse	2.50
Furnace lining	2.50
Greenville, Ill.—Molding coarse	1.40@1.60
Howard, Ohio — Core, furnace lining, molding fine, stone sawing, traction, brass molding	2.00
Sand blast	4.00
Roofing sand	2.50
Glass sand	2.50@3.00
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and looting clay	.90@1.25
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn. — Molding coarse and fine, stone sawing (pit run)	1.75
Klondike, Pacific and Gray Summit, Mo.—Molding fine and core	1.75@2.25
Mapleton, Pa.—Core, dry	2.50
Furnace lining, damp	2.00
Molding fine	2.25@2.75
Roofing sand	2.00@3.00
Sand blast	1.50@2.00
Glass sand	2.25@2.50
Massillon, O.—Traction, molding fine and coarse, core, and furnace lining	2.50
Glass sand	3.00
Michigan City, Ind.—Core, traction	.30@ .40
Mineral Ridge, Ohio — Core, furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction (green)	2.00
Montoursville, Pa.—Core	1.25@1.40
Traction	1.00@1.25
Brass molding	1.50
New Lexington, O.—Molding fine	2.75
Molding coarse	2.50
Oregon, Ill.—Core, glass sand	1.25@1.75

Miscellaneous Sands

(Continued)

Furnace lining	1.50@1.75
Molding coarse	1.25@1.75
Sand blast and stone sawing	3.00@3.50
Ottawa, Ill. — Molding coarse, crude silica sand	.85@1.00
Ottawa, Minn.—Core	1.00@1.50
Glass, molding coarse, stone sawing (all crude silica)	1.00@1.50
Pelzer, S. C.—Glass sand (carload lots only)	.70
Rockwood, Mich.—Core, damp	2.50
Roofing	2.75
Sand blast	3.00
Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60
(All per 2000 lbs.)	
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.60
Furnace lining and molding coarse	3.60@4.25
Coarse core sand	3.60@4.25
Sand blast	2.30@3.60
Stone sawing and traction	2.30
Thayer, Pa.—Traction	2.00
Furnace lining, m'ld'g fine and coarse	1.25
Core—green	1.75@2.00
Utica, Ill.—Core	.85@1.10
Glass sand	1.25@1.50
Furnace lining	.85@2.00
Molding fine and coarse	.85@1.25
Roofing sand	1.25
Sand blast	2.25@3.00
Stone sawing	1.25@2.25
Traction and brass molding	1.25
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O. — Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.00
Traction, brass molding (dry)	2.00
Zanesville, O. — Core, furnace lining, molding fine, traction	2.00
Molding coarse	1.75
Sand blast	4.50
Brass molding	2.00@2.25

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude Talc	3.00
Cubes	50.00
Blanks, per lb.	.07
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt. — Ground talc (150-200 mesh)	8.00@10.00
(In Kraft paper bags. $1.00 per ton less in burlap bags, plus 15c for each bag.)	
Emeryville, N. Y.—150-200 mesh; bags	13.50
Glendale, Calif. — Ground talc (150-200-mesh	16.00@30.00
(Bags extra)	
Ground Talc (50-300 mesh)	13.50@15.50
Gordonsburg, Tenn.—B.P.L. 68%@72%	4.50@6.00
200 mesh)	13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@3.50
Ground talc (20-50 mesh), bags, 7.00; (200-300 mesh) bags	8.25@11.00
Johnson, Vt.—Ground talc (20-50 mesh), bulk	8.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif—Ground talc (150-200 mesh)	18.00@40.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	8.00@10.00
Ground talc (150-200 mesh); bags	9.00@16.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50
(Bags $1.00 extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68%@72%	4.50@6.00
Mt. Pleasant, Tenn. — Analysis, .70 B.P.L. (2000 lbs.)	7.00@7.50

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x7 to 12x6	9.60	8.40	8.10	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.
Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50

(Continued from preceding page)

Ground Rock

Montpelier, Idaho—70% B.P.L.—Crude	5.00
Crushed 2-in. ring and dried	6.00
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.00
Wales, Tenn.—B.P.L. 70%	7.50
Per 2000-lb. Ton	
Barton, Fla. — Analysis, 50% to 65% B.P.L.	3.50@5.00
Centerville, Tenn. — B.P.L. 60% to 65%	6.00@6.50
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Morreston, Fla.—Analysis 60% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 65@70%	5.00@6.50
Norwills, Fla.—(Fla. Hard Rock)—B.P.L. 68%	10.00

Florida Soft Phosphate

Raw Land Pebble

Per Ton

Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

Per Ton

Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	6.00@ 7.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	18.00@20.00	10.00@14.00
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	35.00	12.00@25.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	30.00@32.50	20.00@25.00
Milwaukee, Wis.		20.00@26.50
Missouri river points — Different colors	20.00@25.00	20.00@25.00
Phillipsb'g, N. J.—Green stucco dash		9.00@15.00
Piqua, O.—Marble	8.00@10.00	7.00@ 9.00
Poultney, Vt. — Roofing granules		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.		12.00
Crushed white stone and marble dust in 100 lb. bags	6.50@12.00	
Tate, Ga.—White limestone, sacks extra	5.00@ 7.00	5.00@ 7.00
Wausau, Wis.	14.00@18.00	

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	18.00	26.00@34.00
Bellow Falls, Vt.	18.00	25.00
Birmingham, Ala.	16.00	27.50@50.00
Bridgeport, Conn.	31.00	32.00
Carpenterville, N. J.	20.00	40.00@65.00
Easton, Pa.	16.00	40.00@60.00
Eau Claire, Wis.		30.00@50.00
Eugene, Ore.	25.00@27.00	35.00@75.00
Rochester, N. Y.	21.00	
Friesland, Wis.	25.00	
Houston, Tex.		19.50
Lockport, N. Y.	17.00	
Omaha, Nebr.	16.00@20.00	30.00@40.00
Piqua, O.	15.00	25.00@50.00
Phoenix, Ariz.	16.00	35.00@80.00
Portland, Ore.	23.75	45.00@75.00
Puyallup, Wash.	22.00	50.00@75.00
Rapid City, S. D.	20.00	30.00@60.00
St. Paul, Minn.	16.00	30.00@35.00
Salem, Ore.	25.00@30.00	50.00@75.00
Salt Lake City, Utah	16.00	35.00@40.00
Seattle, Wash.	(select) 20.00	50.00@90.00
Springfield, Ill.	18.00	20.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Walkersville, Ont.	30.00	36.00
Wauwatosa, Wis.	13.00@15.00	28.00@42.00
Winnipeg, Man., Can.	19.00	40.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	9.00
Boston, Mass.	11.50@12.50
Brighton, N. Y.	14.25
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	12.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	12.50
Michigan City, Ind.	10.00
Milwaukee, Wis. (delivered at job)	13.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Saginaw, Mich.	11.50
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	14.00
Washington, D. C.	13.50
Winnipeg, Can.	14.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	.....
Dallas, Tex.	25.00	.....
Denver, Colo.	30.00	.....
Detroit, Mich.	15.25	13.25
Fort Dodge, Ia.	19.70	17.00
Grand Rapids, Mich.	15.65	.....
Los Angeles, Calif.	30.00	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.99	.....
Plasterco, Va.	19.80	.....
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	27.00	.....
	Lump per 180-lb. Barrel (net) Finishing	Common
Atlanta, Ga.	2.00	1.50
Baltimore, Md.	.....	12.00†
Boston, Mass.	3.35	3.10
Cincinnati, Ohio	.....	12.25
Chicago, Ill.	.....	1.40
Denver, Colo.	.....	2.95
Detroit, Mich.	11.50†	10.50†
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	1.70	1.40
New Orleans, La.	.....	1.75
New York, N. Y.	.....	3.69*
St. Louis, Mo.	.....	.70*
San Francisco, Calif.	.....	1.90
Seattle, Wash.	3.25	2.75

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.61
Cedar Rapids, Ia.	2.26
Cincinnati, Ohio	2.35
Cleveland, Ohio	2.26
Chicago, Ill.	1.97
Dallas, Tex.	2.40
Davenport, Ia.	2.21
Denver, Colo.	2.69
Detroit, Mich.	2.17
Duluth, Minn.	1.95
Indianapolis, Ind.	2.21
Kansas City, Mo.	2.30
Los Angeles, Calif	3.06@3.20
Milwaukee, Wis.	2.18
Minneapolis, Minn.	2.24
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.88
New York, N. Y. (includes bags)	2.35
(10c per bbl. discount in 10 days)	
Pittsburgh, Pa.	2.02
Portland, Ore. (sacks 10c ea.)	3.05
St. Louis, Mo.	2.20
San Francisco, Calif. (sacks 10c ea.)	2.73
St. Paul, Minn.	2.24
Toledo, Ohio	2.20
Seattle, Wash. (incl. sacks, 10c ea.)	3.34
F. o. b. Seattle (including sacks)	3.50

NOTE—Add 40c per bbl. for bags.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lbs. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lbs. Per M Sq. Ft.	Wallboard, ⅜x32 or 48", Lengths 6'-10', 1850 lbs. Per M Sq. Ft.
Alabaster, Mich.	3.00	4.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blue Rapids, Kan.	3.00	4.00	6.00	8.00	10.00	10.50	10.00	.....	23.75	19.00	19.375	20.00	36.75
Douglas, Ariz.	.....	.....	5.00	13.00	.....	10.50@12.00	.....	.....	.....	12.50@13.50	.....	.....	.....
Eldorado, Okla.	.....	.....	.....	.....	10.00	10.50	10.00	.....	15.50	.....	27.20	29.30	39.55
Fort Dodge, Ia.	3.00	4.00	6.00	8.00@11.00	10.00	10.50	15.45@22.00	.....	25.80	20.00	19.375	20.00	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	4.00	6.00	8.00	10.00	10.00	18.50	.....	27.25	20.00	19.375	20.00	30.00
Gypsum, Ohio	3.00	4.00	6.00	8.00	10.00	10.00	19.25	7.50	27.95	19.00	19.375	20.00	30.00
Loveland, Colo.	3.00	4.00	6.00	8.00	10.00	10.50	.....	.....	29.80	.....	.....	.....	40.00
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	28.25	21.00	19.375	20.00	30.00
Piedmont, S. D.	.....	.....	6.00	8.00	10.00	10.50	.....	.....	32.25	.....	27.97	31.04	41.18
Plasterco, Va.	4.00	.....	7.00	8.00	10.00	10.00	20.90	.....	29.90	19.00	21.375	22.00	.....
Southard, Okla.	3.00	4.00	6.00	8.00	10.00	10.50	10.00	.....	15.50	.....	26.20	28.70	30.00
Winnipeg, Man.	5.50	5.50	7.00	15.00	16.00	16.00	.....	.....	32.50	18.00	28.50	30.00	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond Plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

News of All the Industry

Incorporations

Johnson Granite Co., Quincy, Mass., has been incorporated at $35,000. President and treasurer, Andrew Johnson and Edward W. Blodgett.

The Doe River Sand Co. has been incorporated in Johnson City, Tenn., with Robert N. Campbell as president and Harold Britton as secretary and manager.

The Midland Sand & Gravel Co. has been incorporated in Dallas, Tex., with a capital stock of $200,000 by E. S. Heyser, W. E. Callahan and W. McCormick.

The Benton & Saline River R. R. has been incorporated to develop the sand and gravel deposits of the Ball-Benton Gravel Co., of Benton, Ark.

The Rockyville Quarries Co., Harrisburg, Pa., has been incorporated to quarry trap rock, limestone, etc. The incorporators are James A. Finn, John Finn and Robert McCreath.

The Grand River Gravel Co., Fort Gibson, Texas, has been incorporated at $25,000 by Jesse W. Lantry, Fort Gibson; W. R. Huycke, Sapulpa, and Leo A. Schumacher, Okmulgee.

The Deckwell Sand and Gravel Co., Chicago, Ill., has been incorporated at $300,000 by William E. Decker, Robert L. Irvin and Miner J. Southwell.

Sand and Gravel

The River Sand & Gravel Co., Winona, Minn., of which Henry Gillette is secretary, has increased its capital stock from $25,000 to $100,000.

The Louisiana Sand & Gravel Co., which was recently organized in Monroe, La., has secured extensive gravel rights on the Monroe & Texas railway near Alpena, and the plant will be established there.

The Muskogee Sand & Gravel Co., which was recently incorporated in Muskogee, Okla., with a capital of $50,000, has selected C. M. Drake as vice-president and general manager, and will put in a plant with a daily capacity of 3000 tons of gravel and 1000 tons sand.

Dealers

Alvin & Co., North Branch, Minn., has been incorporated at $50,000 for the purpose of handling building material.

U. S. Building Co., Chicago, Ill., will issue $2,000,000 first mortgage serial sinking fund 7 per cent gold bonds by permission of the State of Wisconsin.

The Cumberland Cement and Supply Co., Cumberland, Md., will amend its charter and increase its capital stock from $10,000 to $260,000. W. L. Sperry is president.

The Bo-Cin-Pro Manufacturing Co., Rochester, N. Y., has been incorporated at $25,000 to deal in cement and building materials by F. C. Kimmel and W. R. Walker.

Milwaukee, Wis.—Tews Lime and Cement Co. is providing additional office facilities. The plans will call for a new basement and foundation and moving the present building.

Albert N. Wright & Son, Rochester, N. Y., has been incorporated at $3,000 to deal in concrete specialties by Albert N. Wright, Roscoe C. Wright and Curtis Fitzsimmons.

The Two Rivers Co., Two Rivers, Wis., has been incorporated at $30,000 to deal in building material, including lime, cement, etc., by Frank Guse, Jr., Laura Guse, Christ Lappert and Hugo H. Drumm.

Wilmington, Del.—Robertson & Robertson have been granted a charter to do business in building materials with a capital of $1,100,000. The agent is the Corporation Trust Co. of America, Wilmington.

The United Trucking Corporation, Milwaukee, Wis., has been incorporated by Charles Heisen, J. C. Thompson and John Schaefer, to deal in sand, gravel, cement, brick, stone and all building materials; also hauling, trucking and conveying sand, gravel, cement, stone and brick.

Personal

Charles A. Cross will resign as superintendent of the Union Stone Co., Mount Wolf, Pa., on March 18. Mr. Cross will, beginning April 1, act in the same capacity for the M. J. Grove Lime Co., Stephens City, Va.

R. C. Yeoman, extension engineer of the Indiana Sand and Gravel Producers' Association has been appointed a member of Committee D-4 on Road and Paving Materials of the American Society for Testing Materials. This committee has direct charge of investigation and preliminary studies in regard to specifications on road and paving materials as adopted by the society. In view of the fact that a majority of specifications written for building materials take into consideration or quote the specifications of the American Society for Testing Materials, this appointment gives Mr. Yeoman a great opportunity for service to the industry.

Trade Literature

The following trade literature of interest to the rock products industry has been issued recently:

Rock Crushing Equipment—Austin Mfg. Co., Chicago—Catalog 29 is devoted to the gyratory crushers, elevators, screens, hoists, cars, etc., made by this company. The Austin Mfg. Co., are also designers and builders of complete rock-crushing plants. This 48-page catalog contains many illustrations and sectional drawings bringing out the details and application of the products shown.

Sand and Gravel Equipment—American Road Machinery Co., Kennett Square, Pa., Catalog No. 5A illustrates and describes excavating, elevating, conveying, crushing, screening and washing machinery manufactured by this company, of which the Good Roads Machinery Co. are the general sales agents. Excellent halftones show the application of this company's products.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

EQUIPMENT FOR SALE

BOILERS

1—250-H.P. Sterling.
1—300-H.P. B. & W.
2—72"x18' H. F. T. Boilers.

ENGINES

1—24x48 Corliss.
1—18x30 Side Crank Buckeye.
1— 6x 6 Vertical.
1— 6-H.P. Fairbanks and Morse Gasoline.
1—10-H.P. Fairbanks and Morse Gasoline.

WATER HEATERS

1—30 in. x 8 ft. Pittsburg.
1—33 in. x 7 ft. 6 in. Hoppes.
1—30 in. x 7 ft. 6 in. Morrison.

WATER PUMPS

1—5x9x12½x10 in. Compound Duplex Worthington.
1—7x4½x8 Pulling.

STACKS

1—48 in. x 80 ft.

RAIL EQUIPMENT

8—36 in. gauge end dump Quarry Cars.

CRUSHERS

1—30 in. Jeffrey Swinging Hammer Pulverizer.
1—12"x20' Screw Conveyor.

DREDGE MACHINERY

1—Set Dipper Dredge Machinery, 1½ yard Dipper, complete.

THE OHIO GRAVEL BALLAST CO.
2103 Union Central Bldg. Cincinnati, Ohio

FOR SALE

1—42-ton Standard gauge Baldwin Mogul, 160-lb. Steam.
1—36-ton Standard gauge Baldwin Mogul, 11' wheel base.
2—50-ton Standard gauge Brooks 6-wheel switchers, 160-lb. steam.
1—50-ton Standard gauge Shay geared locomotive.
1—42-ton Standard gauge Shay geared locomotive.
2—23-ton brand new 36" gauge Porter 6-wheel switchers, separate tenders.
2—18-ton O & S 8-wheel two-line locomotive cranes.
1—14-B Bucyrus Steam Shovel, mounted on traction wheels.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50' 6x50' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 3½x25', 5x60' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 2½x3" 3x3½' pebble and ball mills; 8x4', 6x4' and 4x4' continuous ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and 6x20' tube mills; 7½x13", 9x15", 16x10" and 30x60" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 36" and 40" cage mills; 3' and 4½' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 3 roll and No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8', 6x5' and 4x3' Newaygo vibrating screens, Richardson automatic scales.

Air compressors and tanks.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

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A LARGE STOCK OF HIGH-GRADE BOILERS OF PRACTICALLY ALL SIZES, TYPES AND MAKES, TAKEN OVER FROM DU PONT CHEMICAL COMPANY'S AND OTHER PLANTS WITH PRODUCTION RECORDS—RECONDITIONED, OFFERED SUBJECT TO ANY INSPECTION, AVAILABLE *NOW!*

"SAVE TIME AND MONEY ON YOUR POWER INSTALLATION—LET DAVIS FURNISH THE BOILERS"

LONG DISTANCE TELEPHONE RANDOLPH 2232

J. F. DAVIS

1122-1123-1124 Harris Trust Building CHICAGO, ILL.

FOR SALE

10 x 14 in. Vulcan, 12-ton dinkey, 36-in. gauge.
Marion dragline excavator, 50-ft. boom, Shop No. 4058.
Williams swing hammer pulverizer, No. D-43.
20—3-yd. side dump, 36-in. gauge Oliver tram cars.
2—American Process dryers, 24 ft. long by 48 in. diam., sprocket driven.
125 H.P., 16 x 24 in. steam engine.
6 H.P. F. & M. gasoline engine.
Worthington steam pump, 10-in. intake, 8-in. discharge, 20-in. cylinders—Shop No. 16876.

E. W. COOPER, Receiver
174 Third Avenue, North Nashville, Tenn.

No. 5 Austin

Gyratory crusher, standard drive, manganese fitted, one extra new corrugated head. Gears like new. Overhauled, now knocked down and open for immediate inspection and shipment. Other bargains in gyratory crushers of all sizes, also jaw crushers, elevators, screens, and general quarry equipment.

Reading Engineering Co., Inc.
1227-A Tribune Bldg. New York, N. Y.

New Rubber Belting

300 ft. 12" 6-ply	$0.99 per ft.
423 ft. 14" 5-ply	1.04 per ft.
527 ft. 14" 6-ply	1.25 per ft.
529 ft. 16" 6-ply	1.39 per ft.
520 ft. 16" 8-ply	1.90 per ft.
150 ft. 18" 6-ply	1.48 per ft.
512 ft. 18" 8-ply	2.00 per ft.

Rolls cut to any length.

The National Belting & Salvage Co.
268 East Water Street, Milwaukee, Wis.

Complete Quarry Equipment

to those contemplating new construction or additions to quarry equipment for the season of 1922.

As a result of alterations in plant equipment, and discontinuing of one operation, a large operator in the stone crushing field has for sale a complete line of high class used equipment, consisting of crushers, elevators, screens, compressors, steam shovels, locomotives and cars and other miscellaneous equipment.

This equipment is in A-1 condition, and should be sold direct to users. If in the market, address

Box 1522, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

FOR RENT AND SALE

13—6-yd. re-built dump cars, std. gauge.
20—12-yd. Westerns, like new, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, used 8 mos.
1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, used six months.
1—Marion 76 steam shovel, No. 3503, std. gauge.
1—P. & H. gasoline drag-line and crane, caterpillars, 40′ boom, ½-yd. bucket, new 1921.
1—Northwest gasoline drag-line and crane, caterpillars, 40′ boom, ½-yd. bucket, new 1921.
1—No. 2 Brown-Hoist four-wheel gasoline crane, std. ga., 40′ boom, ½-yd. bucket, new 1921.

LOCOMOTIVES

1—40-ton 17x24 in. four-wheel switcher.
2—NEW 25-ton six-wheel Porters, separate tenders, 36 in. gauge.
2—18, 14, and 10-ton Vulcans, 36 in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Ill.

IMMEDIATE DELIVERY

SEND US YOUR INQUIRY, STEAM SHOVELS.
50—75-hp. Single Drum Hoists, 25 Cy. Motors.
25—40-55 hp. Double Drum Elec. Hoists, 60 cy.
Nos. 3, 5, 6, 7½, 9K, 18K CRUSHERS.
2—6- and 12-Ton Gasoline Locomotives.
10x12-in. Steam Hoist, 3 Drum with Boiler.
65-hp. Locomotive Type Boiler, 100 lbs.
150-hp. Boiler, Buttstrap with Stkr. 156 lbs.
No. 9K GATES CRUSHER, REGULAR DRIVE.
25, 50, 100, 200 Kw. and larger Turbo, Eng. Sets.
50 to 5000 ft. Steam, Belt & Elec. Drive Comp'a.
10, 15 and 20 Ton Locomotive Cranes.
LARGE AMOUNT CONTRACTORS' EQUIP., LOCO. CRANES, TOWERS, ETC.

Send us your inquiries for Steam Eng's, Centrif. Pumps, Quarry Equip., Motors, Etc.

Ross Power Equip. Co., Indianapolis, Ind.

FIVE NON-UNION STEAM SHOVEL CREWS—STEADY WORK—NO LABOR TROUBLES—9 MONTHS' SEASON.

Plant Located Near Chicago

Address Box 1536, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

FOR SALE

1—Oshkosh Concrete Mixer	$ 300.00
4—Tripod Steam Rock Drills	75.00
1—Swing Hammer Pulverizer, with extra hammers	400.00
1—Sturtevant Rock Emery Mill	350.00
1—Gallon Car Unloader, 18-ton bin	350.00
1—Corrugated Crusher Head for No. 5K Crusher, almost new	75.00
1—Smooth Crusher Head for No. 6K Gates Crusher, brand new	175.00
1—Revolving Screen, 30" diam., 12′ long	200.00
1—Dipper for Marion Model 60 Steam Shovel, 2 ½-yd., new	1000.00
1—Lot 2" Black Pipe, about 2500 ft.	
1—Worthington Duplex Steam Pump, 12" suction, 10" discharge, with brand new steam cylinders	600.00
1—Morris Centrifugal pump, direct connected to steam engine, 10" suc., 8" dis.	450.00
1—Worthington Duplex Pump, 4" suction, 3" discharge	100.00
1—Dean Bros. Duplex Boiler Feed Pump, 2" suction, 1½" discharge	75.00
100 ft. 30" 8-ply stitched canvas belt. Good as new	175.00

All of this equipment is in very good condition; some is almost new. If interested in any of the above items we would be pleased to hear from you.

BIG FOUR STONE CO., Ingalls, Ind.

No. 6 Gyratory Stone Crushers

Two Chalmers & Williams. Little used, $1550 ea. f.o.b. Rahway, N. J.

Relaying Rail and Switches in Stock

E. H. WILSON & COMPANY
Commercial Trust Building
Philadelphia

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New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

"DREDGING PUMP" FOR SALE

One 10" Morris Sand and Gravel dredging pump, 10" suction, 10" discharge, direct connected to double 9x9 engines.
One Scotch Marine Boiler, 200 H. P.

M. A. CALLAHAN
"The Sand Man"
Schofield Bldg. Cleveland, Ohio

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1½ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—¾ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

Sand and Gravel Superintendent

with ten years' experience in operation of the gravel business; have handled pumps, slack way, cable way, drag lines, and industrial machinery in general. Can take full charge of operations; can give good reference; am now holding such a position but wish to make a change to a larger field. Would be glad to correspond with any one wanting such a man. Address **Box 1538, Care of Rock Products**
542 South Dearborn St. Chicago, Ill.

FOR SALE

1—Osgood No. 29 Shovel, traction wheels, 1¼ yd. dipper.
1—No. 2 Duplex Sturtevant Ring Roll Mill.
1—9x15 Farrell Jaw Crusher.
2—70-ft. Belt Conveyors, 18-in. wide.

Hulbert A. Bond, Rowayton, Conn.

FOR SALE

One model 60 Marion Steam Shovel, 2½ yard dipper. Twelve 6 yard Western Dump Cars, steel sills, steel lined ends and bottom, air brake equipment. One No. 5 Gates K Crusher, extra head, gear and pinion. The above equipment is in excellent condition and ready for use. Located in Texas. Address

BOX 617, CORSICANA, TEXAS

FOR SALE

1—No. 5 Austin Crusher, Direct Drive.
1—Three-Roll Bradley Pulverizer.
1—Three-yard Dirt Dipper, with reverasible manganese points for 70 or 70 C Bucyrus Shovel.

This equipment is in A-1 operating condition and should be sold direct to users.

Box 1534, Care of Rock Products
542 S. Dearborn St. Chicago, Ill.

FOR SALE

No. 7½ Telsmith Gyratory Crusher complete with oiling system, in good condition, $1,000.00. F. o. b. Milwaukee, Wis.

G. D. Francey Coal, Stone & Supply Co.
420 Reed St., Milwaukee, Wis.

WANTED

Rotary Dryer, capacity 4 tons sand per hour, natural moisture. State full particulars and price.

Box 1535, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

WANTED

Steam Shovel. 1 yard dipper or capacity for handling 75-100 tons per hour. Desire to rent for few months on reasonable terms.

INTERNATIONAL SILICA COMPANY
Cairo, Ill.

FOR SALE

1—40-Hp. F. B. Boiler with stack and fittings.
1—25-Hp. Portable Boiler and Engine mounted.
A quantity of good Stone Elevator Buckets. Size 17x12x7 and 13x10x7, in good serviceable condition.
1—Little Giant Steam Shovel, Track Type. Needs some minor repairs, but good for a lot of service.

Will Price These Right to Move Quickly.

Detroit-Oxford Gravel & Stone Co.
Oxford, Michigan

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FOR SALE

Trap Rock Stone Quarry and Crushing Plant. Quarry has 18-ft. face. Clean, no stripping required. Unlimited supply of rock, 45 miles from Twin Cities. Just the place to get in on the Minnesota and Wisconsin road work. Plant consists of 1 16-inch McCully gyratory, 1 No. 5 McCully, 1 24-inch Symons disc, 1 36-inch Roll Motors, shaft, pulleys and belts. Air compressor. 500 ft. side track on main line of Soo Ry. Electric power line complete. Will sell complete or any part. Inquire of

RICHARD JELIER
Dresser Junction, Wis.

GRAVEL LAND

FOR SALE. 228-acre farm with fine deep gravel, one-half mile from railroad, midway between Washington and Richmond. Stream through middle of property.

Mrs. Orpha O. Alsop, Summit, Va.

STONE QUARRY FOR SALE

Limestone quarry at Oakfield, Wis., 100-foot face, best quality rock. Quarter mile private R. R. to quarry. 13 miles concrete road to be laid in vicinity. 25 acres, price $6000.00.

W. A. Titus, Fond du Lac, Wis.

SUPERINTENDENT

with over 15 years' experience in the construction, operation and maintenance of stone crushing and screening plants, also in the operation and maintenance of steam shovels, locomotives, drills and other modern equipment used in quarrying and excavation work, is now open for position. References furnished. Address

Box 1529, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

WANTED

Shovelman for a ¾-yard shovel, in a stone quarry, Western Pennsylvania. Married man to locate and work year round, either on shovel or general repairs. Give experience, reference and wages expected. Address

Box 1537, Care of Rock Products
542 South Dearborn St. Chicago, Ill.

F. L. SMIDTH & CO.

50 CHURCH STREET NEW YORK

Engineers

CEMENT MANUFACTURING PLANTS
CEMENT MAKING MACHINERY
PULVERIZED COAL INSTALLATIONS
GRANULATING AND PULVERIZING MACHINES FOR ALL MATERIALS
FLINT PEBBLES—SILEX LINING
THE LENIX BELT DRIVE

PULVERIZED LIMESTONE
WASHED SAND & GRAVEL
AGRICULTURAL LIMESTONE

Complete machinery equipment and detail plans of structures and arrangement of machinery for plants of the above nature.

S. G. ARTINGSTALL, JR., M. E.

First National Bank Bldg. Chicago, Ill.

FULLER PRODUCTS
Insure Fullest Satisfaction

Crushing Rolls.
Pulverizer Mills.
Direct and Indirect Fired Dryers.
Ball and Tube Mill Liners and Partition Plates.
Fuller-Kinyon System for Conveying Pulverized Materials.
Sprockets, Traction Wheels, and Roll Heads.
All kinds of High Grade Chilled Charcoal Iron Castings for All Uses.

Ask for catalogue and prices

FULLER-LEHIGH COMPANY
Fullerton, Pa., U. S. A.

We Design and Equip Complete Plants

for the manufacture of gypsum products, such as wall plaster, moulding plaster, wall board products, gypsum block products, also mixing plants.

We are prepared to furnish complete machinery-equipment and design and furnish plans for the installation. Consult our Engineering Department. Forty years' experience in designing of wall plaster machinery and plants.

The J. B. Ehrsam & Sons Mfg. Co.
Engineers, Machinists and Founders
Enterprise, Kansas

One Billion Dollars

This is approximately the amount of money that will be spent on good roads during the coming year.

Is your plant in proper condition so that you may get your share of this tremendous business? Now is the time to make the necessary changes. We can give you a real engineering service, a service without prejudice, a service that considers only the particular needs of the producer. Quick action will be profitable.

James N. Hatch, C. E., M. E.
Member A. S. C. E.
CONSULTING ENGINEER
736 1st Natl. Bank Bldg. Chicago, Ill.

Robert W. Hunt Jno. J. Cone D. W. McNaugher

ROBERT W. HUNT & CO.
Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories

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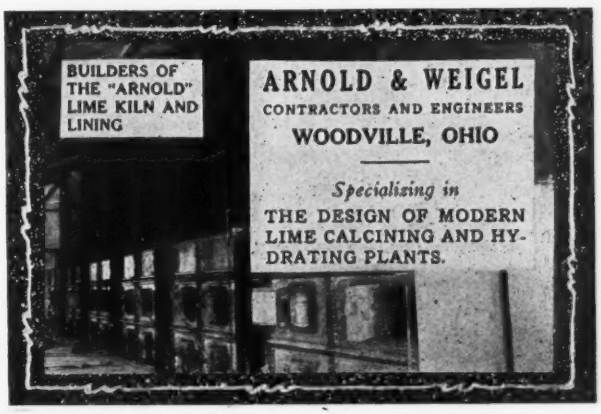
THE STANDARD OF EXCELLENCE

BALDWIN
Industrial and Contractors' LOCOMOTIVES

are in use where dependable motive power is required.

Full information upon request

The Baldwin Locomotive Works
PHILADELPHIA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ARNOLD & WEIGEL
CONTRACTORS AND ENGINEERS
WOODVILLE, OHIO
Specializing in
THE DESIGN OF MODERN LIME CALCINING AND HYDRATING PLANTS.

We Look Into the Earth

By using Diamond Core Drills. We drill for Limestone, Gypsum, Talc, Fire Clay, Coal and all minerals.

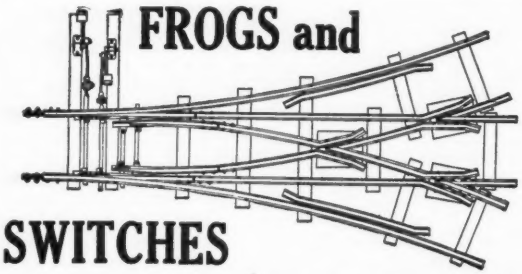
We are fully equipped for testing foundations for bridges, dams, buildings, and all work of a similar character.

PENNSYLVANIA DRILLING CO.
Drilling Contractors
Pittsburgh, Pa.

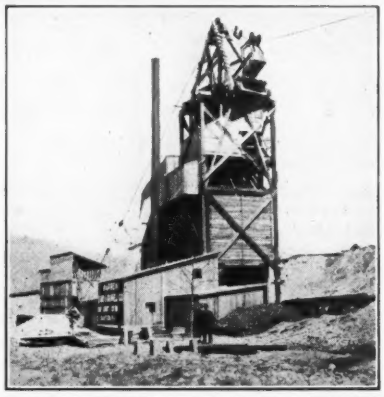
PERFORATED SCREENS AND STEEL PLATE WORK

W. Toepfer & Sons Co.
Milwaukee Wisconsin

FROGS and SWITCHES



The Central Frog & Switch Co., Cincinnati, O.
Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fishplates, Throws, Rail Braces. Tie Plates, Portable Track, Etc., Etc.



SAND and GRAVEL PLANTS

Designs and Estimates to suit your exact conditions.

Also crushing plants new and second-hand

Send for Catalogue

The Cable Excavator Company
2d and Railroad Ave. Fernwood, Del. Co., Pa.

BYERS AUTO-CRANE AND REVOLVING TYPES CRANES

BYERS Cranes

Better than most makers think cranes need to be built—that's Byers Quality in a nutshell. Liberal use of steel and bronze; accurate, painstaking standards in machine-shop and erecting-room. Types and sizes to suit your work. Get Bulletins now.

The Byers Machine Co., 310 Sycamore St., Ravenna, Ohio
Agents in Leading Cities

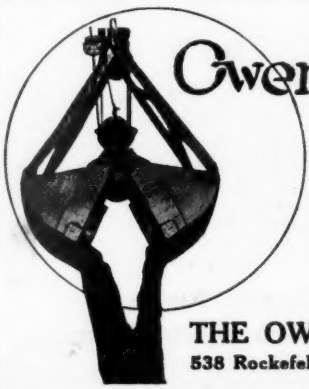
"NEW HOLLAND" ROCK CRUSHERS

Highest in quality
Low in price

Guaranteed to crush all kinds of rock for road and concrete work, ores, coal, cinders, etc.

Write for full particulars

New Holland Machine Company
100 Franklin Street New Holland, Pa., U. S. A.



Owen Buckets

combine dollar-saving features of bucket construction which are illustrated in our latest catalogue.

Write for it today.

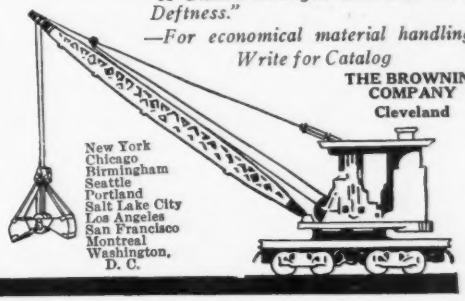
THE OWEN BUCKET CO.
538 Rockefeller Bldg., Cleveland, Ohio

SCREENS
Of All Kinds

Chicago Perforating Co.
2445 West 24th Place
Tel. Canal 1459 CHICAGO, ILL.

Browning Locomotive Cranes

"A Giant's Strength with a Wizard's Deftness."
—For economical material handling.
Write for Catalog
THE BROWNING COMPANY
Cleveland



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The Morgan Producer Gas Machine

is the highest class gas producer built in the U. S. and is advertised in this journal the first issue of each month.

Morgan Construction Company
Worcester, Mass.
Pittsburgh Office: 704 Arrott Bldg. Telephone Court 1381

CARS

WE MAKE CARS FOR
COAL, ORE, STONE, SAND, GRAVEL,
CLAY AND BRICK. DRYER AND INDUSTRIAL
CARS. THE WATT FACTORY IS THE LARGEST IN
THE WORLD DEVOTED ALONE TO CAR BUILDING
OVER 50 YEARS' EXPERIENCE
CATALOGS
The Watt Mining Car Wheel Co.
BARNESVILLE, OHIO

TERRY
FAMOUS
DERRICK IRONS, FITTINGS
AND ERECTORS' TOOLS

FULL CIRCLE CRANES. "EQUIPMENT THAT LASTS." TIMBER & STEEL DERRICKS

LET US SOLVE YOUR MATERIAL HANDLING PROBLEMS.

All Types of
Steel and Timber DERRICKS TERRY

WHY? — WOOD DRILLS

Because They—
Drill faster
Stand more abuse
Need less repairs
Thrive on hard work

Men who know, prefer "WOOD DRILLS"
Because they fill the bill and cut the cost.

Wood Drill Works
30-36 Dale Ave. Paterson, N. J.

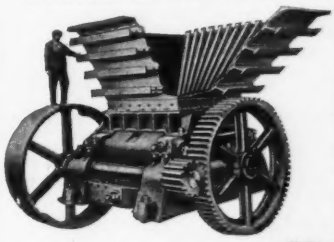
MITCHELL ELECTRIC VIBRATING SCREEN

The Mitchell has revolutionized screening by the rapidity of vibration of the screen cloth—3600 vibrations per minute, by the peculiar upward rotary movement imparted to the screen cloth by the heavy impact of meshes against material—500 to 1000 pounds, and by the screen's utter freedom from racking or jarring. It handles all classes of material, coarse or fine, wet or dry.

Write us for complete description and data on Mitchell installations.

STIMPSON EQUIPMENT CO.
Felt Bldg Salt Lake City —Grand Central Terminal Bldg. New York

"PENNSYLVANIA" Single Roll Crusher

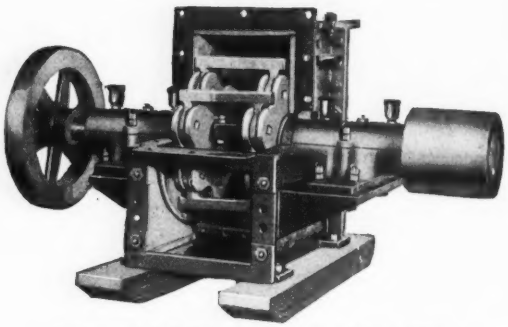


The New Series of "Pennsylvania" Single Roll Crushers take grab-bucket feed of limestone, cement rock, gypsum and similar materials, — wet and sticky, — without feeder, and make maximum reduction in one operation. All parts readily accessible. Maintenance cost lower per ton than for any other type. Massive construction — Reliable Safety Devices — Convenient adjustment.

Put Your Reduction Problems Up to Us

PENNSYLVANIA CRUSHER COMPANY
Stephen Girard Bldg., Philadelphia

New York
Pittsburgh



Interior of K-B Pulverizer showing Lining Plates

Does the Material You're Handling Pulverize Your Pulverizer?

All parts of the K-B Pulverizer that come in contact with the material to be crushed are made of Manganese Steel.*

Only STEEL will stand the stress
"K-B" is built ALL-Steel
All "K-B" wearing parts are Manganese Steel

Send for Catalog with full particulars

K-B Pulverizer Company, Inc.
92 Lafayette Street
New York

K-B PULVERIZER

**The best material obtainable for the duty required.*

INTERNATIONAL BARRELS

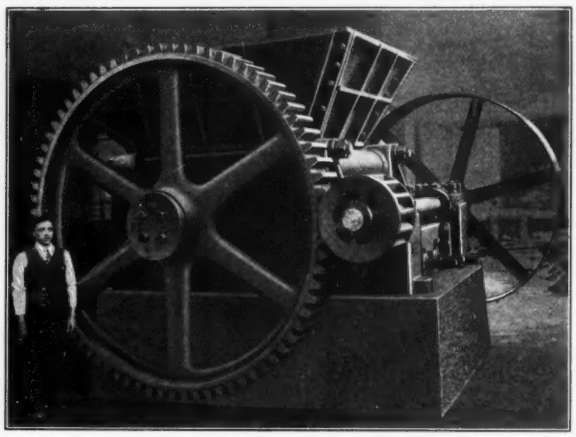
are without equal for quality, strength and durability

They are the best containers used in the Lime, Cement and Plaster Trades.

Our several branch shops permit quick deliveries of these QUALITY BARRELS to your plant, wherever it is located.

Samples and prices sent on request

International Cooperage Co., Inc.
Niagara Falls, N. Y.



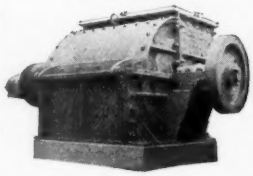
If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.
Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.



Gruendler Hercules Crushers

Gruendler Hercules Crushers are reducing production costs in hundreds of plants throughout the country.

"America's Famous Crushers"

For Crushing and Pulverizing Limestone, Lime, Gypsum, Shale, etc., a Gruendler cannot be beat.

Write for Interesting Bulletin

Gruendler Patent Crusher & Pulverizer Company
908 North Main Street **St. Louis, Mo.**

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Registered U. S. Patent Office

For Shafting and Machinery

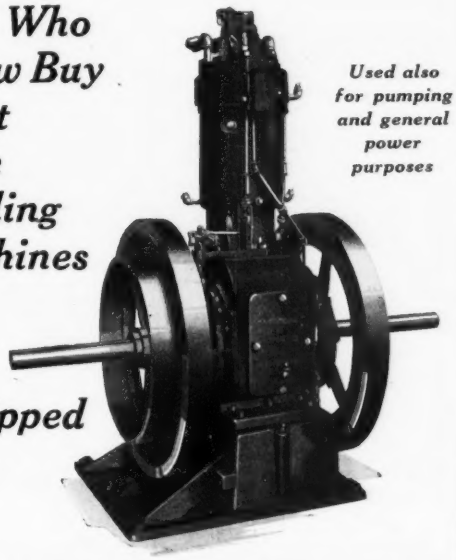
The trade mark identifies the real Albany Grease—a mark known and respected around the world since 1868, for fair dealing, a quality product and an unexcelled service.

Your dealer stocks it.

Adam Cook's Sons
708 Washington Street, New York

Grease

Men Who Know Buy Blast Hole Drilling Machines



Used also for pumping and general power purposes

Equipped with

COOK ENGINES

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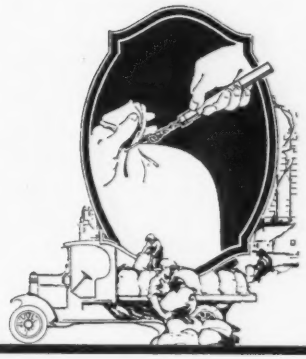
THE COOK MOTOR CO.
DELAWARE, OHIO



BATES WIRE TIES

have long since been universally accepted as the most secure, saving, and efficient means for closing bags of all sizes and descriptions.

OVER THREE HUNDRED MILLION BAGS were closed the Bates Way during 1921 in the Rock Products Industries alone.

A Free trial of Bates Wire Ties will convince you and will show you how we save time and money for our big family of satisfied customers.

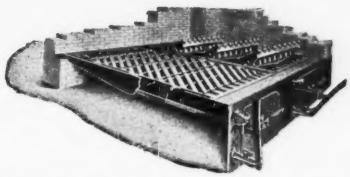
A Free Trial Outfit

consisting of one tying tool and liberal samples of wire ties suitable for your purposes will be gladly sent upon receipt of your agreement to try it on your work and within fifteen days send us $3.50, the price of the tying tool, or return it to us. The sample wire ties cost you NOTHING.

BATES VALVE BAG COMPANY

7326 South Chicago Ave. Chicago, Ill.

110 Great Portland St. London, W. I., England



McGinty installations would not be found so frequently in the notable plants of the country except for the fact that engineers in specifying equipment, appreciate that proved permanence and sure satisfaction are indispensable.

McGINTY GRATES

withstand a higher degree of heat without warping than any other grate on the market —the greater air area permits a deeper bed of fuel—it is a shaking, sifting and dumping grate and the fires can be cleaned with closed doors.

Send for descriptive matter and prices.

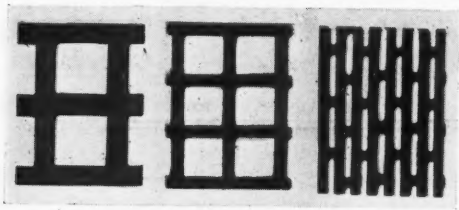
The Kramer Bros. Foundry Co.
Dayton, Ohio

All the extras that most trucks require are standard equipment with the Pierce-Arrow. It's complete, ready for instant service and long, uninterrupted service.

Pierce-Arrow
TRUCKS

The Pierce-Arrow Motor Car Company
Buffalo, New York

2-ton $3200 3½-ton $4350 5-ton $4850 fully equipped



Perforated Steel Screens

of Every Description for

Stone, Gravel Sand, Cement and All Minerals

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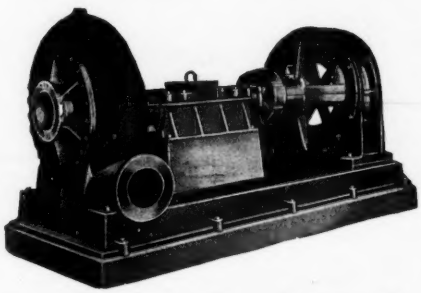
114 LIBERTY ST. NEW YORK



Heavy Service Dredging Pump

Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4" up, arranged for belt, motor, or engine drive.

Morris Machine Works
Baldwinsville, N. Y.

39 Cortlandt Street, New York City
Real Estate Trust Bldg., Philadelphia, Pa.
217 N. Jefferson St., Chicago, Ill.

Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

Morris

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines

Where there's smoke, there's fire

Where there's DES MOINES TANKS, there's protection!

DES MOINES STEEL TANKS are recommended by the management of industrial plants, municipal and railroad officials, and others throughout the United States and Canada, and many foreign countries. These customers appreciate the advantage of consultation with the corps of engineers we maintain at each of our three plants. This consultation and the advice tendered, incurs no obligation whatever. You can also secure carefully compiled data on cost of maintenance and operation.

DO not hesitate to ask questions; remember DES MOINES design, fabricate, and erect every type of structure that can be manufactured from steel shapes and plates, in addition to every type of tank.

Write today for Catalog No. 46. If you have a problem tell our engineers about it

Pittsburgh-Des Moines Steel Co.
846 Curry Building, Pittsburgh, Pa.

PLANTS
Pittsburgh
Des Moines
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DES MOINES

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TIME and money are saved and won by keeping up with the progress of industry. Changing conditions, methods, prices must be reckoned with to win success. **Rock Products** is the authoritative source of business and technical information in the rock products industry. It is edited from the field by experienced practical men.

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The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge, and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pennsylvania

The Clyde Lime Hydrator Performance Counts

The Clyde was first in the field, and through dependable and economical performance is still first choice of lime operators.

The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

Simple, easiest to operate and most economical in cost of installing, maintaining, and operating.

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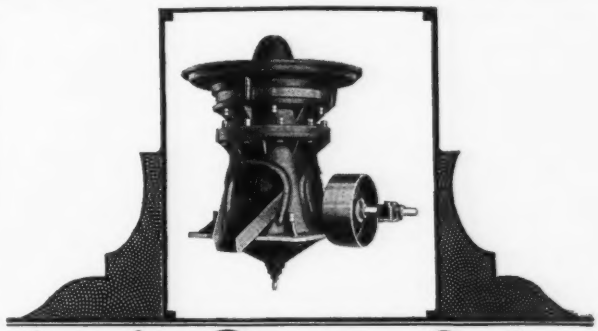


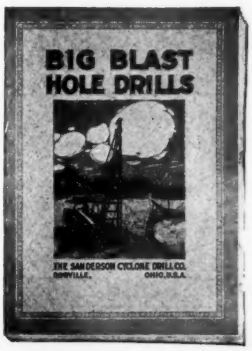
Austin Gyratory Crushers

Stationary and Portable Types

are fully illustrated and described in Catalog 29-T just off the press. If you are interested in crushers, send for the catalog for it explains in detail the reasons for the remarkable records made by the Austin. These records of low operating costs, high production figures and all around efficiency are a result of the many exclusive Austin features.

The catalog also illustrates and describes elevators, screens, bins, cars, etc., and contains layouts of many particularly successful crushing plants. Your file will not be complete without it.

Austin Manufacturing Co.
New York CHICAGO San Francisco



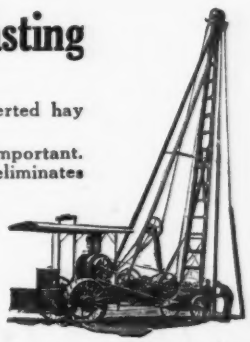
Analyze Your Drilling and Blasting

Our new Blast Hole Catalog B-46 (96 pages) will help you.

The day of poking a hole down with a rivet header or a converted hay bailer is past.

Drilling, being the first step in stone production, is the most important. One cent or one-half cent per ton cost saved in this operation often eliminates competition.

With Cyclone No. 14 Drills on the job and Cyclone Service in reserve, your drilling and blasting troubles fade—and your costs will be right.



THE SANDERSON-CYCLONE DRILL CO.
Orrville, Ohio
Eastern and Export Office, 30 Church St., New York

The Kritzer Continuous Lime Hydrator

HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

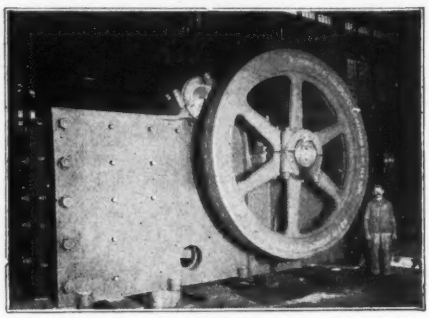
A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY

503 South Jefferson Street CHICAGO, ILL.

BUCHANAN JAW CRUSHERS

ALL STEEL PATENTED



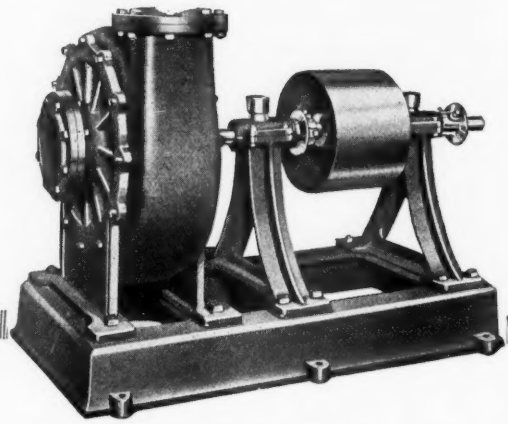
Side View—Type "C" Buchanan Box Frame, All Steel Jaw Crusher. Bulletin No. 10

Years of manufacturing experience, combined with an intimate knowledge of the conditions under which such machines operate, assures the purchaser of Buchanan Equipment machines of remarkable durability.

COMPLETE CRUSHING PLANTS

C. G. BUCHANAN CO., Inc.

Cedar and West Streets New York City



Lightning Pumps

In the Lightning Centrifugal Sand, Gravel and Dredging Pump, your dollars will command for you a measure of worth that can hardly be matched by any other product in its class.

They are the masterful evidence of what great skill and high specialization can accomplish, not only in design but in construction.

It will pay you to write for prices and complete information

Address Pump Dept.

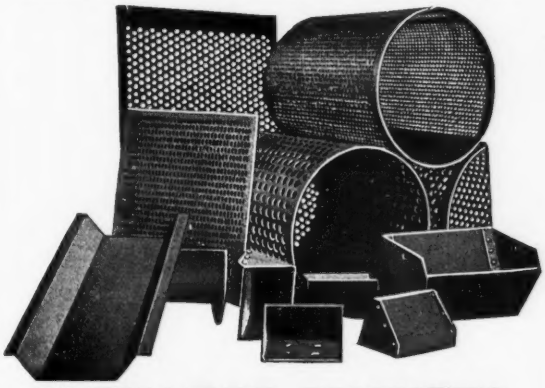
Kansas City Hay Press & Tractor Co.
Kansas City, Mo.

STURTEVANT "ONE-MAN ONE-MINUTE" "OPEN-DOOR" MACHINERY

Crushing, Grinding, Pulverizing,
Screening, Sizing, Air Separating, Mixing,
Weighing, Elevating and Conveying Machinery
Complete Units -:- -:- Engineering Service

STURTEVANT MILL CO., HARRISON SQUARE **BOSTON, MASS.**

Perforated Metal Screens
FOR
Stone, Gravel, Sand, Etc.

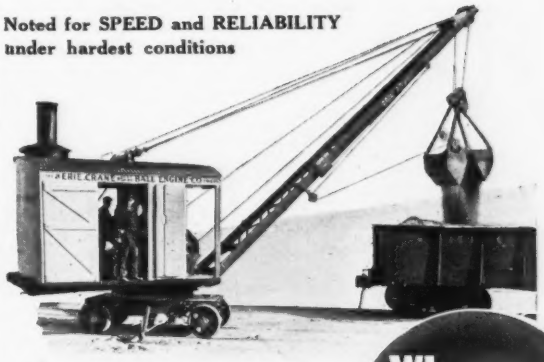


ELEVATOR BUCKETS
PLAIN AND PERFORATED

General Sheet and Light Structural Work
"Light and Heavy Steel Plate Construction"

Hendrick Mfg. Co.
CARBONDALE, PA.
New York Office, 30 Church Street
Pittsburgh Office, 915-916 Union Bank Bldg.
Hazleton, Pennsylvania, Office, 705 Markle Bank Bldg.

Noted for SPEED and RELIABILITY under hardest conditions



When you need extra output

This machine saves you money even when it is working at only one-fourth capacity, and replacing only 10 or 12 men—

And when you have ***rush orders,*** and are working your plant to the limit, your ERIE Crane can give results like these:

"We loaded 300 tons of sand in 2 hrs. and 10 min., digging 3 to 8 ft. below track level. This time included moving from car to car.

"This is too speedy, but we wanted to know what our ERIE Crane can do."—W. B. Manny Pres., Hoosier Slide Sand Co., Michigan City, Ind.

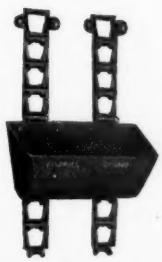
Let us send full description of the ERIE Crane. Write for Bulletin P-30.

Every ERIE Crane can be quickly and easily changed to steam shovel.

BALL ENGINE CO., Erie, Pa., U. S. A.
Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels
BALL Engine Co. Erie, Pa.

CALDWELL Service



HALF a million dollars worth of well selected stock, constantly maintained, and an organization keyed up to the theory that plant efficiency is measured by the number of orders shipped on the day of receipt, accounts for Caldwell service.

H. W. Caldwell & Son Co.
LINK-BELT COMPANY, OWNER
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17th Street and Western Avenue
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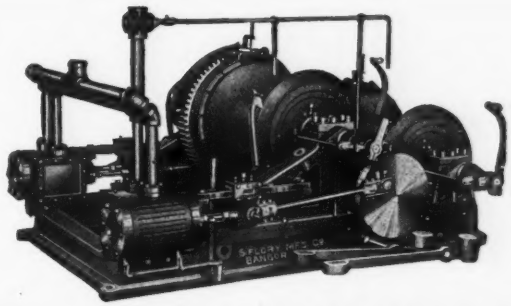

FLORY HOISTS

Flory Standard Double Cylinder, Double Friction Drum Hoisting Engine. Each drum, fitted with our improved patent friction, possessing high efficiency, accuracy in lowering, and ease of operation.

Consult with us on your material handling problems. Our engineers are always at your service.

A Flory Hoist for Every Purpose

FLORY CABLEWAYS are extensively used in excavation, hoisting and conveying operations. They might solve your problem.

Catalogs on request

S. FLORY MFG. CO.
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BERRY'S FLEXIBLE PIPE JOINTS

For Pontoon Lines Have Revolutionized Hydraulic Dredge Boat Work

With Patented Locking Device

1" to 4" of Brass for Steam, Air, Oil and Water

6" to 12" Without Locking Device. (Made of Cast Steel)

These Joints are made of the best quality cast steel and brass and are stronger than the pipe itself. They will take any angle up to 17 degrees without leaking. If you are troubled with leaking joints on your pipe line, Write Us.

Berry Flexible Pipe Joint Co. **26 South 15th St., Philadelphia, Pa.**

METRO NITE

for Stucco-

Stucco Buildings, Concrete Blocks or Bricks faced with Metro-Nite are beautiful, artistic and everlasting.

Metro-Nite White is of a crystalline character, really a siliceous dolomite. It is extremely hard, sharp and cleanly graded, making a bright, sparkling face.

Free samples mailed on request.

Two colors—White and Green.

The Metro-Nite Co.
333 Hartford Ave., Milwaukee, Wis.

Among the Precious Stones—

GREENSTONE

Is the one lasting ornament for surfacing Stucco. The natural olive-green color blends in harmony with Nature's color scheme, and age only tends to deepen the shade. The pure white back-ground of stucco, dashed with our No. 48 product, gives you a finish of unequalled beauty and durability.

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Commercial Stone
Greenstone Flour
Terrazzo Stone
Roofing Granules
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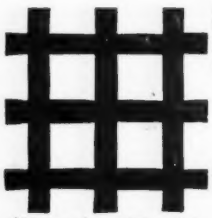
Prices on Application

Greenstone Products Company, Inc.
Mills: Deerfield, Md. **Roanoke, Virginia**

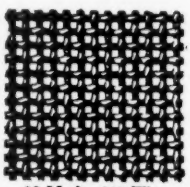
"CLEVELAND" DOUBLE CRIMPED WIRE CLOTH



2½ mesh; .105 wire

A uniform fineness is assured by the use of "Cleveland" Double Crimped Wire Cloth, making it unequalled for the screening of Sand, Gravel, Crushed Stone and Cement. "Service" is the definite policy of this organization, and through every phase of manufacture this end is constantly before us.

A large stock always on hand. However, any special mesh will be manufactured to suit requirements. PRICES RIGHT

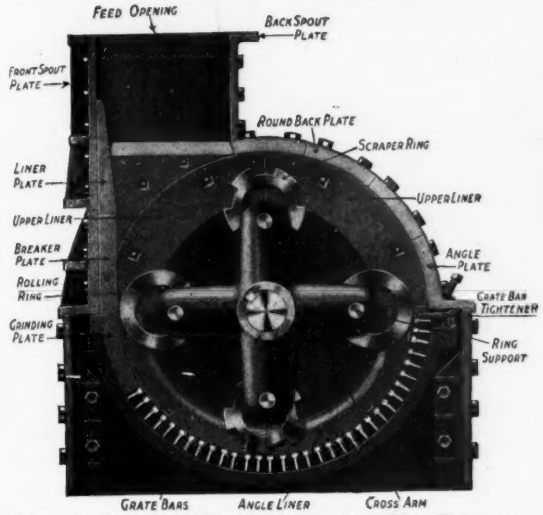


1¾ Mesh; .047 Wire

THE CLEVELAND WIRE CLOTH AND MANUFACTURING COMPANY

3573 East 78th Street **Cleveland, Ohio**

Greater Tonnage Lower Operating Cost

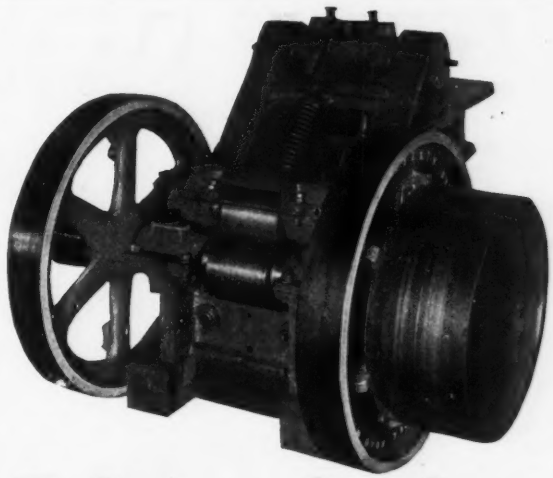


Cross Section of the Standard American Ring Pulverizer

The flexibility of the Rolling Rings prevents break downs or damage to the Pulverizer caused by foreign material passing into the machine.

Write us for particulars

AMERICAN PULVERIZER COMPANY
Gen. Office and Factory: 18th and Austin Sts.
ST. LOUIS, MO.



Reliance Crushers

IN ALL SIZES FOR EITHER PORTABLE PLANTS FOR ROAD BUILDING OR STATIONARY QUARRY INSTALLATIONS.

BUILT FOR LONG, HARD SERVICE—WILL SAVE YOU MONEY IN THE LONG RUN

Let us quote you prices

Universal Road Machinery Co., Kingston, N. Y.

Branches in all principal cities in U. S. and Canada

MANUFACTURERS OF THE FAMOUS RELIANCE LINE OF ROAD BUILDING AND QUARRY EQUIPMENT

WHEN in the market for machinery or equipment, look through the advertisements of ROCK PRODUCTS. If you do not find what you want advertised in this issue, write us and we will put you in touch with reliable firms who can supply your need. This service is free to our readers. Use it.

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542 South Dearborn Street
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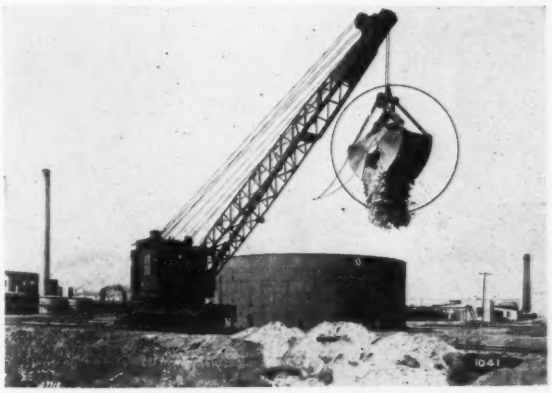

Clam Shell Buckets at Bargain Prices

We are offering a limited number of "Type 'R' Clam Shell Buckets" in 1½ and 2 cu. yd. sizes for immediate shipment at the exceptionally low prices of—

$725.00 F. O. B. Bedford, for the 1½ cu. yd. Bucket, weighing 4250 pounds and

$850.00 F. O. B. Bedford, for the 2 cu. yd. Bucket, weighing 4975 pounds.

These buckets are of the flat link power wheel type and are of heavy substantial construction.

This type of bucket is especially adapted to the handling of coal, limestone, sand, gravel and other similar materials.

If you wish to purchase a superior bucket at the above prices you must act quickly.

THE McMYLER INTERSTATE CO., Cleveland, Ohio

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Chicago, Illinois, 812 Edison Building
Seattle, Washington, Hoge Building
Denver, Colorado, 18th and Wazee Sts.
San Francisco, Calif., 766 Folsom Street
New Orleans, La., 444 Maison Blanche Annex
Birmingham, Ala., Brown-Marx Building
Boston, Mass., 261 Franklin Street

PLAMONDON
TRANSMISSION MACHINERY

Dust Proof Friction Clutches—

The continuous friction surfaces of the Plamondon Disc Type Friction Clutch, consists of but three parts, with all the simple mechanism for adjusting and operating on the outside in plain view.

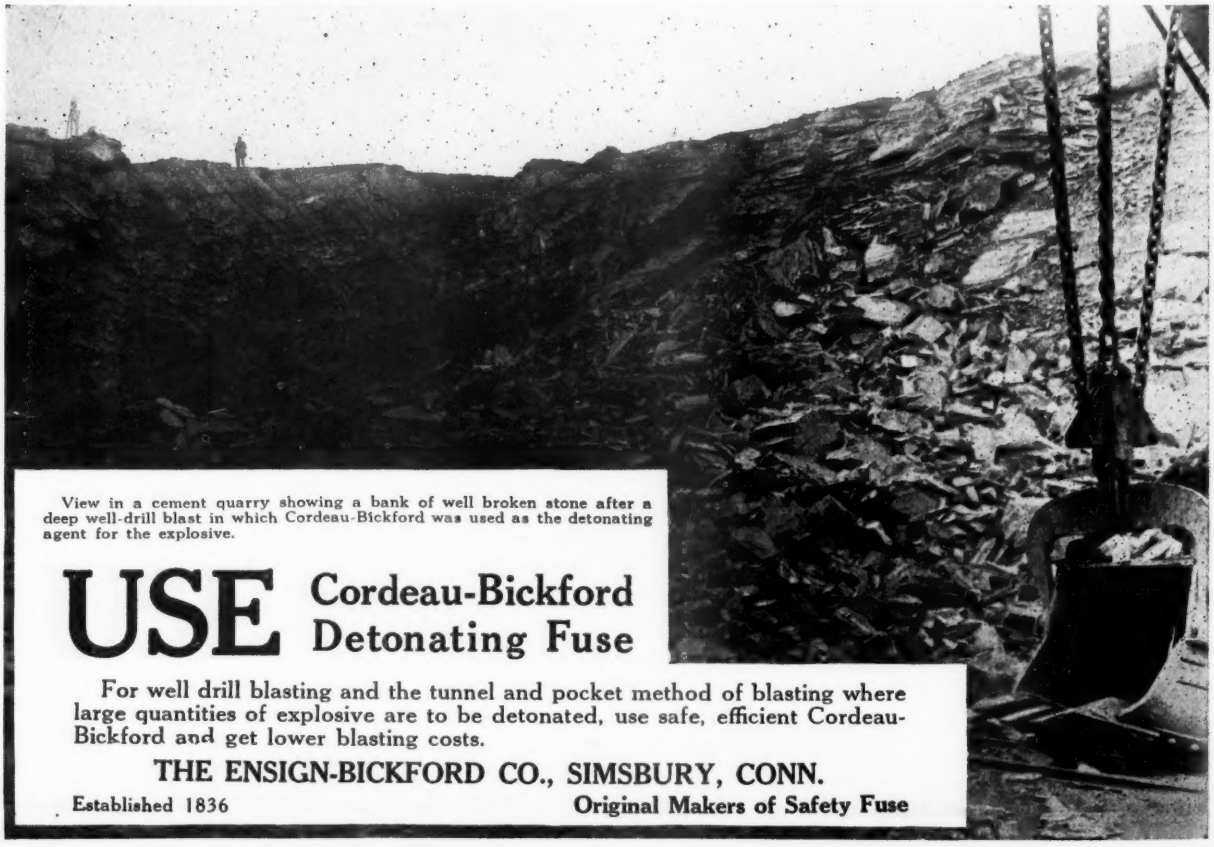
No part is affected by centrifugal action—they can be run at high speed with safety, and without loss of efficiency. The adjustment for wear is made entirely by means of one adjusting collar, which gives a uniform pressure on all parts of the friction surfaces. These surfaces are absolutely dust proof, and are universally used by leading cement mills.

Our products also consist of Heavy Gearing, Cut Gears and Machine Molded Gears of all kinds—Shafting, Pulleys, Hangers, Couplings, Collars, Pillow Blocks, Worm-Wheels, Fly-Wheels, Rope Sheaves, Grey Iron and Semisteel Castings by analysis.

We Solicit Inquiries

A. PLAMONDON MANUFACTURING CO.

Engineers, Founders, and Machinists
Established 1859 — Incorporated 1877
Works and Main Office: 5301 South Western Boulevard, Chicago, Illinois
EMERGENCY ORDERS RECEIVE SPECIAL ATTENTION



View in a cement quarry showing a bank of well broken stone after a deep well-drill blast in which Cordeau-Bickford was used as the detonating agent for the explosive.

USE Cordeau-Bickford Detonating Fuse

For well drill blasting and the tunnel and pocket method of blasting where large quantities of explosive are to be detonated, use safe, efficient Cordeau-Bickford and get lower blasting costs.

THE ENSIGN-BICKFORD CO., SIMSBURY, CONN.

Established 1836 **Original Makers of Safety Fuse**

ATLAS EXPLOSIVES
USED ON BIG JOBS EVERYWHERE

The blaster who uses Atlas Non-Freezing is not only SAVED the inconvenience of thawing required when ordinary explosives are used in freezing weather, but he also is IMMUNE from the headache tortures that result from handling large quantities of the ordinary forms of high explosives. Tell us what explosive you now are using and we will tell you what grade of Atlas Non-Freezing will do YOUR work.

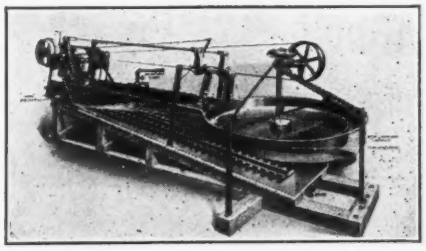
ATLAS POWDER COMPANY
WILMINGTON, DEL.

Branch Offices:—Allentown, Pa.; Birmingham, Ala.; Boston; Chicago; Houghton, Mich.; Joplin, Mo.; Kansas City; Knoxville; McAlester, Okla.; Mexico City, Mexico; New Orleans; New York; Philadelphia; Pittsburg, Kan.; Pittsburgh, Pa.; Pottsville, Pa.; St. Louis; Wilkes-Barre.

DORR

WASHING

Sand and Gravel
Phosphate Rock
Clay and Talc
Ochre
English Chalk
Limestone



THE DORR BOWL CLASSIFIER

Cleaner, more evenly graded products with less waste and at lower operating costs.

Separation at any point from 20 to 350 mesh.

Low power consumption. Practically no attendance or upkeep. Continuous, automatic production. Requires no re-arrangement of present plant.

Write us for details as applied to ***your*** operation.

The Dorr Company
Engineers

Denver **101 Park Avenue New York** **London, E. C.**

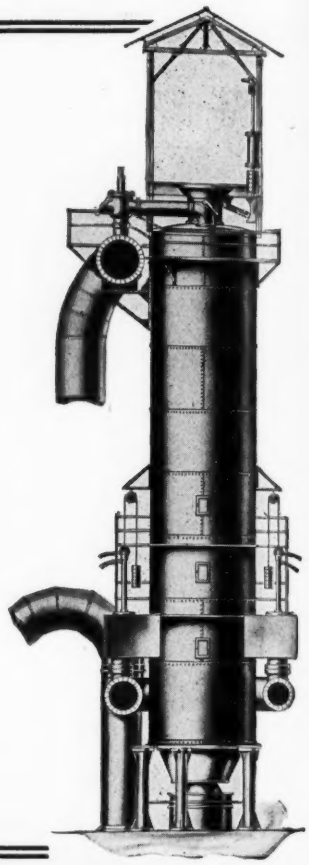
RESEARCH TESTS DESIGN EQUIPMENT

Continuous Discharge—Gas Fired

LIME KILNS

The wastefulness or efficiency of any lime burning apparatus is determined by the amount of fuel per ton of lime produced.

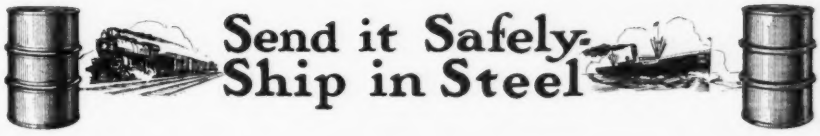
Our Kilns are not an experiment, but have successfully met the test of years of actual service. The design is the work of our Consulting Mechanical and Chemical Engineer, who has had many years of practical operative experience. They embody a number of labor saving devices, and are designed to secure maximum production with minimum fuel consumption; their record in this respect should interest every lime producer in the country.



Glamorgan Pipe & Foundry Company

Lynchburg, Va., U. S. A.

Using the Nationally Famous Virginia Foundry Irons



Send it Safely-Ship in Steel

DMC
Reg. U. S. Pat. Off.

No. 12 Light Shipping Steel Barrel

Serving the Lime Field

For one year we have been offering the lime and cement field the services of the Draper Steel Barrel. Results have so far justified our efforts that we feel impelled to say to every producer that the advent of our steel barrel in this field has marked an epoch in the shipping of rock products.

If you are not using Draper Steel Barrel Service get in touch with our sales department

"What the Shipper Puts In the Customer Takes Out"

THE DRAPER MFG. CO.

8906 Crane Ave. Cleveland, Ohio

District Sales Offices:

New Orleans, La.—203 Pan-American Bldg.; E. J. Putzell, Dist. Sales Mgr.
New York—110 William St.; C. B. Peters Co., Inc., Eastern Sales Representative
Chicago, Ill.—128 N. Wells St.; Amco Sales Corporation.
San Francisco, Cal.—16 California St.; The Hale Co.

Our. No. 9 Catalogue Just Fits Your Pocket

You're Not Pulling Dead Weight With a Shay

There is no dead weight on a Shay. Every pound is used for pulling.

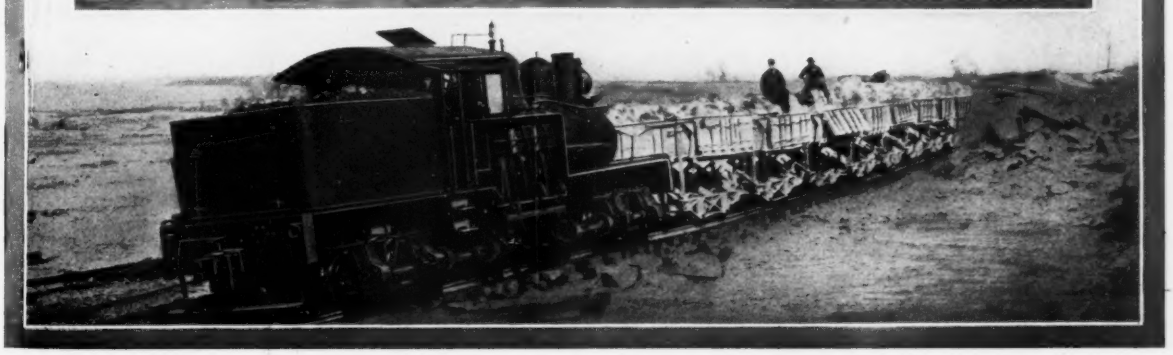
Even the tender wheels are geared to the main driving shaft and contribute to the hauling power.

With no dead weight to pull, a Shay Geared Locomotive will handle a heavier load than will a rod engine and tender of equal weight.

The Shay has many other advantages not the least among them being dependable low-cost operation. A note to Lima will bring further particulars.

LIMA LOCOMOTIVE WORKS, Incorporated

Lima, Ohio 17 East 42nd St., New York



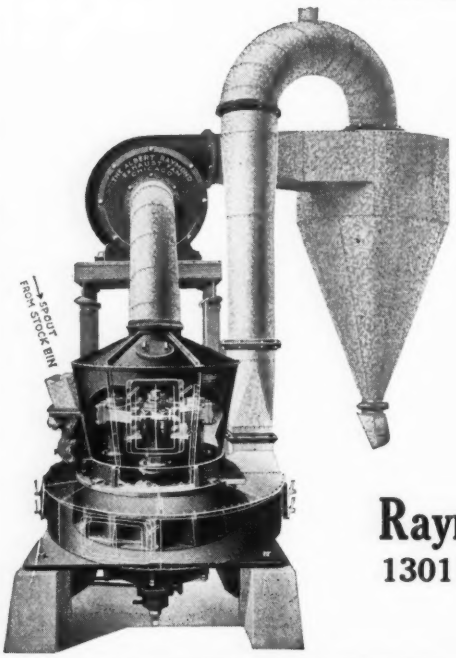
Schaffer Lime Plants can be built in small units embodying all the essential economical features of our large plants. Owing to freight conditions and the necessity for localizing certain operations, the

Schaffer Engineering & Equipment Co.

are in a position to offer a real service in connection with the design and installation of lime plants of either large or small capacity. The matter of economy in operation, whether in large or small units, will be paramount for the next several years. Also the necessity of quality as evidenced by Schaffer Engineering and Equipment Company plants is equally important.

Schaffer Engineering & Equipment Co.
2828 Smallman Street **PITTSBURGH, PA.**

Grinding 6.9 tons per hour of Tennessee Brown Phosphate Rock to a fineness of 95.7%, passing a 100-mesh test sieve with an expenditure of 90 hp.



A Raymond Roller Mill equipped with Air-Separation is giving the above results in one of the most modern, up-to-date Acid Phosphate Plants recently built.

The Mill is a complete unit which takes the rock from storage, grinds it and delivers finished uniform material dustlessly to a storage bin set high enough to discharge into the weighing hoppers by gravity. No screens, makeshift air-separators, elevators or conveyors are required.

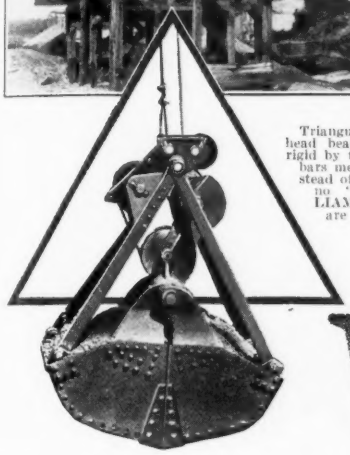
The uniform fineness of the rock means a constant quantity of acid and less acid per ton of fertilizer produced.

An investigation of Raymond Roller Mills for your work will be well worth your time.

Raymond Bros. Impact Pulverizer Company
1301 North Branch Street **Chicago, Ill.**

Western Office: 201 Boston Bldg., Denver, Colo.
Eastern Office: 50 Church St., New York City

Positive Dirt Proof Lubrication of All Bearings—*It's a* WILLIAMS



Triangular construction: The head bearing is held perfectly rigid by the WILLIAMS corner bars meeting in a triangle instead of a quadrangle. There's no "wobble" to a WILLIAMS. And the sheaves are held perfectly in line.

"Better than any other Buckets we have ever used"—

writes F. W. Schmidt, Pres., Morris County Crushed Stone Co., Morristown, N. J.

Many bucket users, like Mr. Schmidt, have a strong preference for the WILLIAMS, based on wide experience. They have found the WILLIAMS "Favorite" is not only a speedy bucket, but it also has strength to *stand up* in steady service.

Large one-piece hinge bearing **takes the place of five parts ordinarily found on a clamshell bucket. By reducing the number of moving parts here from *five* to *one*, a much simpler and much stronger construction is obtained. It results in a stronger bucket.**

Positive lubrication **of the hinge bearing saves wear—makes it grit-proof and self-cleaning.**

Write for the WILLIAMS *catalog.* It is full of interesting pictures showing all kinds of clamshell work, and blue-prints of all types of WILLIAMS Buckets. Shall we send a copy? No obligation.

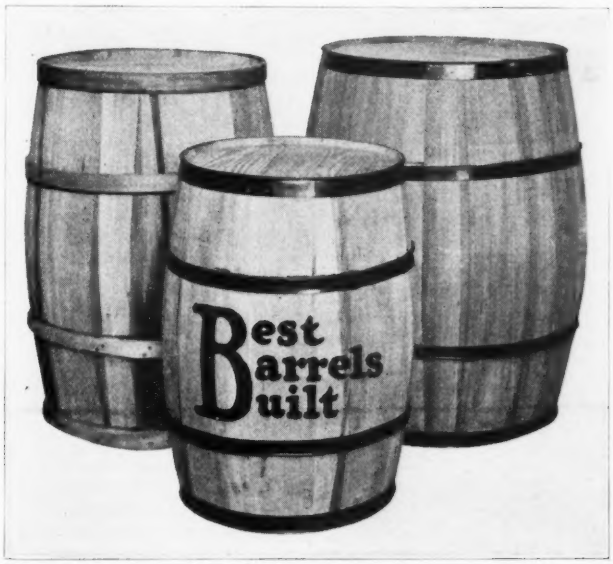
G. H. WILLIAMS CO., Erie, Pa., U. S. A.

WILLIAMS

QUICK-ACTING CLAMSHELLS

All Parts Guaranteed Against Breakage

The Wooden Barrel is Superior



THIS organization maintains for your convenience, forty-seven shops and warehouses in central and eastern states; and own or control the output of a large number of stave and heading mills located in the timber district of the Southwest. Therefore we are prepared to deliver the "Best Barrels Built," made of tongued and grooved staves, glued heading, thoroughly Kiln dried, and bound with wood, wire or steel hoops to meet your requirements.

These barrels are practically indestructible, rat, vermin and moisture proof, and meet all the government and railroad requirements for the safe transportation of poisonous substances.

If you are in a hurry, we can supply you.

SANDUSKY COOPERAGE & LUMBER CO., Toledo, Ohio

Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in Rock Products

AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AUTOMATIC WEIGHERS
Schaffer Eng. & Equipment Co., Pittsburgh, Pa.

BAGS AND BAG MACHINERY
Bates Valve Bag Co., Chicago, Ill.
Jaite Co., The, Jaite, Ohio.
Valve Bag Co. of America, Toledo, Ohio.

BARRELS—Lime
Draper Mfg. Co., The, Cleveland, Ohio.
International Cooperage Co., Niagara Falls, N. Y.
Sandusky Cooperage & Lbr. Co., Toledo, Ohio.

BELTING
Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
New York Belting & Packing Co., New York, N. Y.

BIN GATES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bacon, Earle C., Inc., New York City.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.

BLASTING SUPPLIES
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

BRICK MACHINERY
Besser Sales Co., Chicago, Ill.
Shope Brick Co., Portland, Ore.

BUCKETS—Elevator
Hendrick Mfg. Co., Carbondale, Pa.
Orton & Steinbrenner, Chicago, Ill.

BUCKETS
Blaw-Knox Co., Pittsburgh, Pa.
Browning Co., Cleveland, Ohio.
McMyler Interstate Co., Cleveland, Ohio.
Owen Bucket Co., Cleveland, Ohio.
Williams Co., G. H., Erie, Pa.

CABLEWAYS
Blaw-Knox Co., Pittsburgh, Pa.
S. Flory Mfg. Co., Bangor, Pa.
Interstate Equip. Co., New York, N. Y.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Constr. Co., Easton, Pa.
Watt Mining Car Wheel Co., Barnesville, Ohio.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., N. Y. City.

CEMENT MILL REPAIRS
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

COMPRESSORS, AIR
Ingersoll-Rand Co., N. Y. City.

CONVEYORS AND ELEVATORS
Caldwell, H. W., & Son Co., Chicago, Ill.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.

CRANES—Locomotive Gantry
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Byers Mach. Co., The, Ravenna, Ohio.
McMyler-Interstate Co., Cleveland, Ohio.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Bacon, Earle C., Inc., New York, N. Y.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
Chalmers & Williams, Chicago Heights, Ill.
Fuller-Lehigh Co., Fullerton, Pa.
Good Roads Machinery Co., Kennett Square, Pa.
Gruendler Pat. Crusher Co., St. Louis, Mo.
Jeffrey Mfg. Co., The, Columbus, Ohio.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Munson Mill Machinery Co., Utica, N. Y.
New Holland Machine Co., New Holland, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Road Mach. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

DERRICKS
Terry Mfg. Co., New York, N. Y.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

DRILLS
The Loomis Machine Co., Tiffin, Ohio.
Sanderson Cyclone Drill Co., Orrville, Ohio.
Wood Drill Works, Paterson, N. J.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DYNAMITE
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
General Explosives Co., Chicago, Ill.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

ENGINES—Steam
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Arnold & Weigel, Woodville, Ohio.
Artingstall, S. G., Jr., Chicago, Ill.
Austin Co., The, Cleveland, Ohio.
Bacon, Earle C., Inc., New York, N. Y.
Buckbee Co., J. C., Chicago, Ill.
Fuller Engineering Co., Allentown, Pa.
James N. Hatch, Chicago, Ill.
R. W. Hunt & Co., Chicago, Ill.
Randolph-Perkins Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.

EXCAVATORS
Ball Engine Co., Erie, Pa.
Owen Bucket Co., Cleveland, Ohio.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

FUSES
Ensign-Bickford Co., Simsbury, Conn.

GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.

GEARS
Caldwell, H. W., & Son Co., Chicago, Ill.
Plamondon Mfg. Co., Chicago, Ill.

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

GRATES
The Kramer Bros. Fdy. Co., Dayton, Ohio.

GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

HOISTS
Flory Mfg. Co., S., Bangor, Pa.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

HOSE—Water, Steam, Air Drill, Pneumatic Tool
Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
N. Y. Belting & Packing Co., New York, N. Y.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

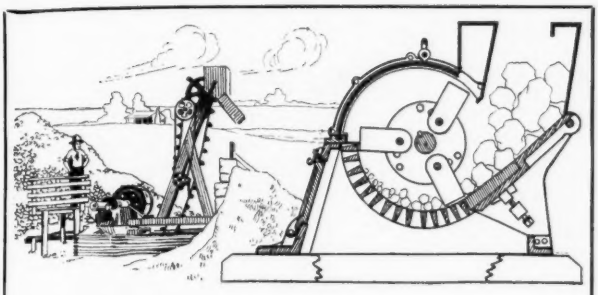
HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

LIME KILNS
Arnold & Wiegel, Woodville, Ohio.
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Steacy-Schmidt Mfg. Co., York, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Ball Engine Co., Erie, Pa.
Haiss Mfg. Co., The Geo., New York City.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Lima Locomotive Works, New York, N. Y.
Porter Co., H. K., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

(Continued on page 80)



Lower Cost of Agricultural Lime

WILLIAMS Limestone Crushers cut the cost of producing agricultural or commercial crushed stone, because:

1st. **The hinged hammer principle,** originated by Williams, is economical of power.

2nd. **The freedom from repairs** due to their super-strength, saves money and prevents shutdowns.

3rd. **The revolving - hammer** grinding principle gives Williams mills enormous capacity.

4th. **They take larger stone.** Even our smallest unit takes 60 lb. stone. Crushes to any size desired. With proper grates, the Williams Mills produce macadam four times as fast as fertilizer size.

Get the Facts from Users

Write for the names of users nearest you. More than fifty lime and cement companies operate Williams Crushers, besides scores of co-operative agricultural lime producers, road builders, material dealers and others. Each user has had his crushing needs carefully analyzed and a Williams Crusher built to fit them. *No charge for preliminary plans.*

Address Dept. 4

WILLIAMS PATENT CRUSHER AND PULVERIZER COMPANY
HINGED HAMMER — ESTABLISHED 1871

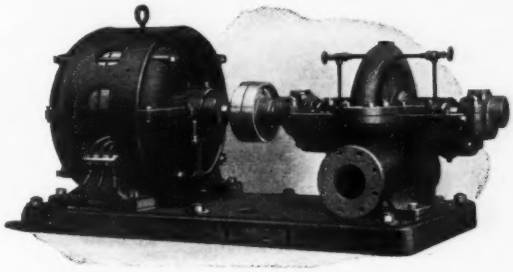
Plant and General Offices
2701-2723 North Broadway
St. Louis, Missouri, U. S. A.

67 Second St., San Francisco, Calif.

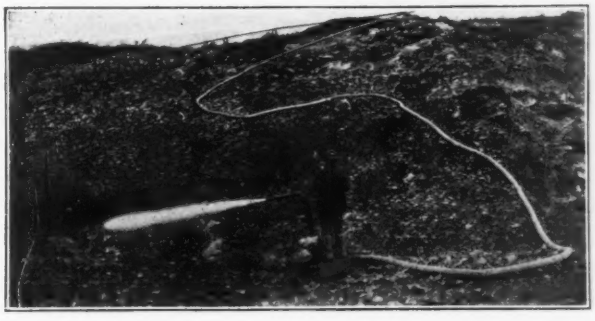
37 W. Van Buren St. Chicago, Ill.

Williams
Patent Crushers – Grinders – Shredders

CENTRIFUGAL PUMPS FOR ROCK PRODUCTS INDUSTRIES



The successful application of Allis-Chalmers pumping units to the various kinds of pumping done in the Rock Products industries make the use of similar pumps for your requirements worth careful consideration. The combined units of undivided responsibility consisting of Allis-Chalmers pumps driven by Allis-Chalmers motors as described in our latest bulletin will be found adaptable and useful as gravel washing pumps, drainage pumps, stripping, etc. If you do not have our centrifugal pump bulletin 1632-E it will be sent on request and will be found to contain information of value in the consideration of pumping work.



ALLIS-CHALMERS
MANUFACTURING COMPANY

ELECTRICAL MACHINERY
STEAM TURBINES — STEAM ENGINES
HYDRAULIC TURBINES
GAS ENGINES — OIL ENGINES
MINING MACHINERY
CRUSHING AND CEMENT MACHINERY
FLOUR AND SAW MILL MACHINERY

PUMPING ENGINES
CENTRIFUGAL PUMPS
CONDENSERS
AIR COMPRESSORS — AIR BRAKES
STEAM AND ELECTRIC HOISTS
AGRICULTURAL MACHINERY
POWER TRANSMISSION MACHINERY

MILWAUKEE, WISCONSIN. U.S.A.

Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in Rock Products

(Continued from page 78)

MOTOR TRUCKS
Pierce-Arrow Motor Car Co., Buffalo, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PACKING—Sheet, Piston, Superheat, Hydraulic
Cincinnati Rubber & Mfg. Co., Cincinnati, Ohio.
N. Y. Belting & Packing Co., New York, N. Y.

PAINT AND COATINGS
Williams, C. K., & Co., Easton, Pa.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PIPE JOINTS
Berry Flexible Pipe Joint Co., Philadelphia, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

PORTABLE CONVEYORS
Stephens-Adamson Mfg. Co., Aurora, Ill.

POWDER
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

POWER TRANSMITTING MACHINERY
Caldwell, H. W., & Son Co., Chicago, Ill.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
K. C. Hay Press & Tractor Co., Kansas City, Mo.
Morris Machine Works, Baldwinsville, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PULVERIZED FUEL EQUIPMENT
Fuller-Lehigh Co., Fullerton, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

PUMP VALVES
N. Y. Belting & Packing Co., New York, N. Y.

QUARRY EQUIPMENT
Good Roads Mach. Co., Kennett Square, Pa.
Universal Road Mach. Co., Kingston, N. Y.

ROPE, WIRE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

SAFETY DEVICES—Goggles, Respirators, Etc.
Pulmosan Safety Equipment Co., Brooklyn, N. Y.

SCRAPERS, DRAG
Sauerman Bros., Chicago, Ill.

SCREENS
Cross Eng. Co., Carbondale, Pa.
Good Roads Machinery Co., Kennett Square, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link-Belt Co., Chicago, Ill.
Simplex Screen Co., Salt Lake City, Utah.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Stimpson Equip. Co., Salt Lake City, Utah.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Tyler Co., The, W. S., Cleveland, Ohio.
Universal Road Mach. Co., Kingston, N. Y.
Weller Mfg. Co., Chicago, Ill.

SEPARATORS
Rubert M. Gay Co., New York City.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Tyler Co., The W. S., Cleveland, Ohio.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York, N. Y.

SHEAVES
Chicago Mining Sheave & Roller Co., Chicago, Ill.

SHOVELS—Steam and Electric
Ball Engine Co., Erie, Pa.
Bucyrus Co., South Milwaukee, Wis.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.

SHOVEL REPAIRS—Steam and Electric
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

SLATE WORKING MACHINERY
S. Flory Mfg. Co., Bangor, Pa.

STEEL PLATE CONSTRUCTION
Hendrick Mfg. Co., Carbondale, Pa.

STUCCO FACINGS
Crown Point Spar Co., Inc., New York City.
Greenstone Products Co., Roanoke, Va.
The Metro-Nite Co., Milwaukee, Wis.

SWITCHES AND FROGS
Central Frog & Switch Co., Cincinnati, Ohio.
Easton Car & Constr. Co., Easton, Pa.

TANKS, STEEL STORAGE
The Blaw-Knox Co., Pittsburgh, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.
The Stacey Bros. Gas Constr. Co., Cincinnati, Ohio.

TESTING SIEVES AND TESTING SIEVE SHAKERS
Tyler Co., The W. S., Cleveland, Ohio.

TRAMWAYS
Interstate Equip. Co., New York, N. Y.

WASHERS, SAND AND GRAVEL
Link Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

WELDING EQUIPMENT
Oxweld Acetylene Co., Newark, N. J.

WHEELS, AXLES AND JOURNAL BOXES
Easton Car & Constr. Co., Easton, Pa.

WIRE ROPE
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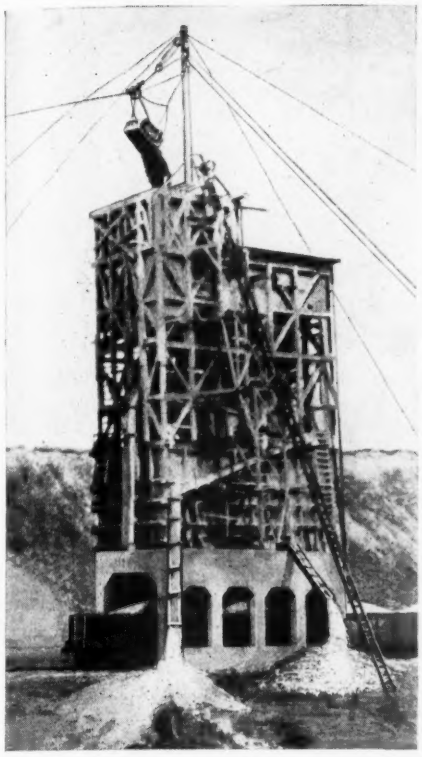

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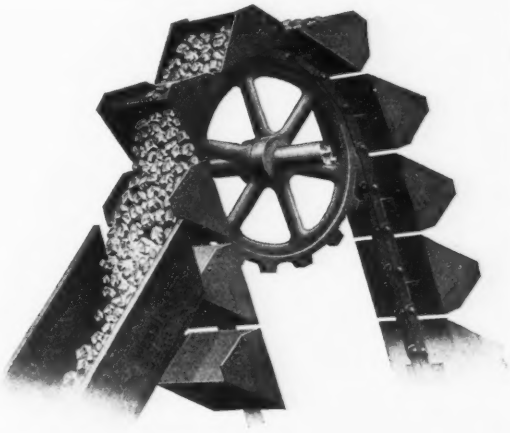

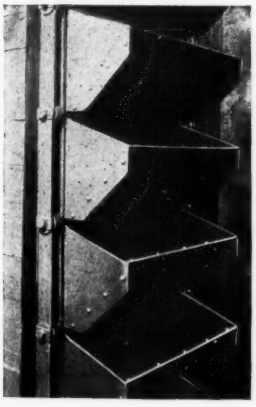

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READERS OF "ROCK PRODUCTS":—This Department is for your special help and service. If you do not see what you require advertised in "Rock Products," tell us your needs and we will publish them here. There is no charge for this service.

American Cement Plaster Co., care A. W. Tyler, Chem. Eng., Military Road, Buffalo, N. Y., want full information and prices on Diamond Core Drills, about 2-in. core for prospecting gypsum.

Delphi Lime Co., Delphi, Ind., want catalogs and prices on tripod drills and pyrometers.

Twin City Brick Co., 515 Pioneer Bldg., St. Paul, Minn., want catalogs and prices on car pullers, clutches, winches, gear speed reducers, dragline excavators, dust collecting systems, unloaders, washing and weighing equipment.

Ferdinand G. Schultz Co., Jenkins Arcade Bldg., Pittsburgh, Pa.—Attention Mr. Geo. S. Edgar, Mgr., advise that they want prices and information on machinery for pulverizing white silica sand into graded products, consisting of 50 mesh, 100 mesh and 150 mesh.

Union Cement Products Co., 19 Christine St., Elizabeth, N. J., are in the market for a small crusher to crush aggregates for cement block; also all kinds of cement products machinery.

Fred J. Schmidt, The Diamond Sand & Gravel Co., Stop 2, A. B. & C. El. Line, Bedford, Ohio, want prices and data on concrete block machinery, mixers, etc. Also equipment for unloading slag to storage and then to trucks.

The O. Limoges Estate, 40 Prospect St., Montreal, P. Q., Canada, write us as follows: "We want information regarding apparatus, instrument, device, method or process whereby burning lime in kiln may be scientifically controlled and whereby more particularly the time may be accurately determined, when the chemical compound (limestone) in the kiln is entirely broken by the heat and lime is thoroughly burned by the wood burning process."

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